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THE FEDIAS OF THE NORTHERN UNITED STATES.

BY PROF. THOS. C. PORTER.

About thirty years ago, two Fedias with fruits of singular shape were discovered by Mr. Sullivant, near Columbus, Ohio, and published by him as new species under the names of *F. umbilicata* and *F. patellaria*. They soon disappeared from their original station, and no botanist seems to have met with either of them again until the Rev. S. W. Knipe of the Delaware Water Gap collected, in the spring of 1870, a few specimens of *F. patellaria*, in Westmoreland County, Pa., and early in June, 1871, a large supply in the neighborhood of Columbia on the Susquehanna River, where it grew in great profusion along with the *F. radiata* of Michaux.

Specimens of this plant, placed in my hands by the collector, exhibited such diversities in the fruit as to suggest the idea that both it and *F. umbilicata* might in the end prove to be forms of *F. radiata*. Dr. Gray, to whom the conjecture was communicated, kindly furnished fruits from Mr. Sullivant's plants, to complete the chain of evidence, and the information that *F. umbilicata* had also been rediscovered, last summer, on the Hudson River.

The Manual of Dr. Gray contains five species of Fedia; one an introduction from Europe (*F. olitoria* Vahl.), and four indigenous. All of them are much alike in general appearance, and amongst the latter especially the resemblance is so great that their specific characters are derived from the fruit alone; but how far these char-

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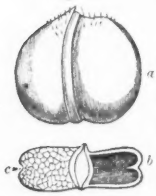
acters are constant and reliable, it will now be my endeavor to show, aided by illustrations from the pencil of Mr. Knipe.

Fedia olitoria Vahl., Fig. 102. Fruit; *a*, side view; *b*, cross section with the confluent empty cells shaded. The spongy mass (*c*) on the back of the fertile cell clearly separates this naturalized foreigner from our native species. It differs also in its more humble and diffuse habit, and the pale blue color of its corolla.

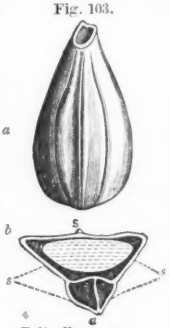
Fig. 102.



Fedia olitoria.

Fedia Fagopyrum Torr. and Gray. Fig. 103. Fruit (from West Penn.); *a*, side view; *b*, cross section, with the two empty cells shaded. Despite the smaller number of stigmas, the structural plan of the ovary, as seen in the five well-defined dorsal sutures (103 *b*, *s*), is quinary. A single ovule is developed and fills up the cavity of the three posterior confluent cells. The two anterior sterile cells are compressed laterally, until they *almost* meet in a sharp angle, making the fruit triquetrous like a grain of buckwheat. Between the sharp edges of the angle a narrow groove (103 *b*, *a*) runs from base to apex. In a considerable number of matured fruits examined, from W. Penn. and W. N. York, this groove was found uniformly present. All, too, were more or less downy under a lens, and in no case were the sterile cells confluent. These are variations from the typical plant as characterized in Gray's Manual, and yet the peculiar shape of the fruit and its large size (two lines in length) will probably enable it to hold its place as a distinct species.

Fig. 103.



Fedia Fagopyrum.

Fig. 104.

Fedia radiata.

Fig. 105.

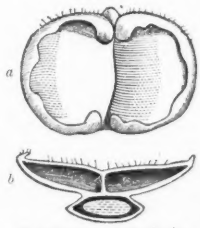
F. radiata, var. *patellaria.*

Fedia radiata Michx. Fig. 104. Fruit; *a*, side view; *b*, cross section, with the two empty cells shaded; *c*, cross section of another fruit, with the two empty cells confluent. The fruit of this species is much smaller, about a line in length, and usually quite downy, but sometimes smooth. The quinary structure of the ovary is not so apparent. As in all these Fedias the bracts are more or less strongly ciliated, or perfectly

naked. In one particular the description should be amended. Under favorable circumstances it often attains the height of thirty inches, and its range of stature is about that of *F. Fagopyrum*, one to two feet.

Fedia radiata Michx., var. *patellaria* (*F. patellaria* Sulliv.). Fig. 105. Fruit (from Columbia, Pa.); *a*, side view; *b*, cross section, with the two slightly divergent empty cells shaded. This small form varies but little in size and shape from the fruit of genuine *F. radiata* as seen in Fig. 104, *a* and *b*, and appears to have been derived from it by a moderate extension of the walls of the empty cells.

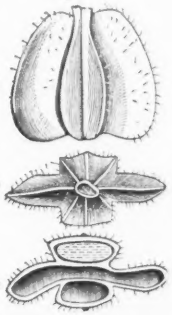
Fig. 106.



F. radiata var. *patellaria*.

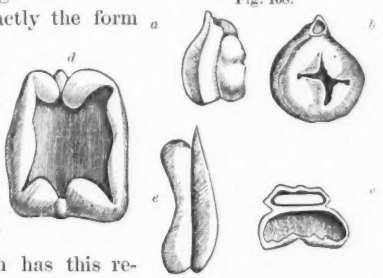
Fig. 106. Fruit (from Columbia, Pa.); *a*, side view; *b*, cross section, with the two widely divergent empty cells shaded. Here the abnormal lateral extension of the walls of the empty cells is carried to an extreme, and they are so flattened in the centre and curved up on the margins as readily to suggest the image of a miniature platter. This is exactly the form of fruit in Mr. Sullivant's plant in Dr. Gray's herbarium. Fig. 107. Fruit (from Columbia, Pa.); *a*, side view; *b*, end view above; *c*, cross section, with the empty cells shaded. One specimen of Mr. Knipe's last collection has this remarkable form of fruit throughout. It seems to have been produced by the doubling of that represented in Fig. 106. Two fruits have coalesced by the union of their anterior empty cells, and the dissepiments vanishing have left a single large cell in the middle. On one side the usually fertile cell is empty; on the other, it contains a seed but in some cases *all the cells* are sterile.

Fig. 107.



F. radiata, var. *patellaria*.

Fig. 108.



F. radiata, var. *umbilicata*.

Fedia radiata Michx., var. *umbilicata* (*F. umbilicata* Sulliv.). Fig. 108. Fruit (from Columbus, Ohio); *a*, side view; *b*, another side view, showing the cruciform opening caused by the tendency of the cell in the abnormal expansion of its walls to split along the sutures; *c*, cross section of the same; *d*, side view of a more mature fruit, showing a further enlargement of the opening into the empty cell; *e*, another side view. As the fruit of the former variety came probably from that of *F. radiata*, with two empty cells, as seen in Fig. 104 *b*, so this may have been derived, by the operation of the same cause, from that of Fig. 104 *c*, with the empty cells confluent.

In view of the decided disposition toward monstrosity evident in Fig. 107, and the differences of the fruits in size and shape, it is questionable whether *F. patellaria* and *umbilicata* are worthy to stand even as varieties of *F. radiata;* but, since no typical fruits of the latter have been observed intermingled with the aberrant forms on the same stalk, they may for the present be recognized as such.

MIMICRY IN THE COLORS OF INSECTS.

BY DR. H. HAGEN.

Having observed that in treating of the interesting phenomena of mimicry, writers have used indiscriminately very different factors, I shall try to give some preliminary ideas which I do not find published, and which I believe will be useful in explaining this interesting subject.

It will be best to consider the color and pattern separately. There are three different kinds of colors: viz., colors produced by interference of light, colors of the epidermis, and colors of the hypodermis. All three may either be wanting, or all three, or two of them may occur together in the same place.

Colors produced by interference are produced in two different ways: first by thin superposed lamellæ, as in the wings of Diptera, Neuroptera, etc., without any other color, as in hyaline wings, or connected with other colors as in the scales of Entimus and others.

There must be at least two superposed lamellæ to bring out

colors by interference, and there cannot be more than four, as both wings and scales consist only of four layers, two internal belonging to the hypodermis, two external belonging to the epidermis. In fact, if scales taken from dry specimens of Entimus are observed under the microscope, many partly injured can be found, which give different colors according to the layers of the lamellæ which remain.

Secondly, colors by interference are produced by many very fine lines or striæ in very near juxtaposition, as in Apatura and other color changing insects. Colors by interference may perhaps be sometimes also produced in the same way as in the feathers of the dove's neck by very small impressions situated near together.

The colors produced by the interference of light are only optical phenomena, differing in this respect from the other colors of the body, the epidermal and hypodermal colors.

The epidermal colors belong to the pigment deposited in the cells of the chitinized external skin, the epidermis. These colors are mostly metallic blue, green, bronze, golden, silver, black, brown, and perhaps more rarely red. The epidermal colors are very easily recognized, because they are persistent, never becoming obliterated or changed after death.

The hypodermal colors are situated in the non-chitinized and soft layer, called hypodermis by Weismann. They are mostly brighter and lighter, light blue or green, yellow, milk white, orange and all the shades between. The hypodermal colors *in the body* of the insect fade or change, or are obliterated after the death of the insect. A fresh or living insect when opened may easily be deprived of the hypodermal colors simply by the action of a little brush. I said hypodermal colors in the body, because there are hypodermal colors which are better protected, being encased nearly air-tight, and therefore are more easily preserved even after the death of the insect. I refer to the colors in the elytra and wings, and in their appendages, the scales. The elytra and the wings are, as is well known, at first open sacs in communication with the body, of which they are only the extension: of course they are formed of the epidermis and hypodermis which become so strongly glued together after the transformation into the imago state that a maceration of years tried by me showed no effect at all on such wings. This fact is very interesting as it explains how wings, and even colored wings, can be found in palæontological

layers in good preservation. The destruction of insects, which is so peculiar to the secondary strata in England, proves, as I believe, that the bodies of the insects must have floated a very long time before they were deposited. It is quite a rarity to find well preserved insects there although many very well preserved wings even of lace-winged flies have been described.

There is an interval after the transformation before the membranes of the wings become inseparably glued together; it is at this time that the finishing of the colors takes place. For instance in an Æschna, a *Libellula depressa* or *trimaculata*, if the wing is cut off at the base, the two layers can be easily separated by manipulation under water, and the wing can be inflated with a little tube by separating the borders with a knife. I can show specimens so prepared. But this is only possible as long as the wings possess the appearance of having been dipped into mucilage, an appearance which is well known in young Odonata.

The scales have just the same development as the wings. At first they are little open sacs, communicating with the hollow of the wing and the whole body, and at a later period are glued together like the wings themselves.

In the wings and in the scales the hypodermal colors are formed and finished before the wings stick together, and by this means they are well preserved and safely encased. They have no more communication in the glued parts with the interior of the animal, and are preserved in the same way, as if hermetically inclosed in a glass tube. There are even here in the wings and scales many epidermal colors, chiefly the metallic ones; but all the brighter colors (for instance the somewhat transparent spots in the elytra of the Lampyridæ, Cicindelidæ, etc., and in the greater number of Lepidoptera) are, as I believe, hypodermal colors.

Finally there sometimes occurs outside of the animal, that is, on the epidermis, a kind of color which I consider as hypodermal color, such as the pale blue on the abdomen of many Odonata, the white on the outside of many Hemiptera, the pale gray on the elytra and thorax of the Goliathus beetle, the powder on Lixus and others. Some of these colors are very easily resolved in ether, and are apparently a kind of wax. I believe that these colors are produced by the hypodermis and are exuded through the little channels of the pores (*Poren Canäle*).

The hypodermal colors are very often different in males and

females of the same species, the epidermal colors rarely differ so far as I know; but there are genera with prominent epidermal colors which are nearly always different in different sexes, viz., Calopteryx, Lestes, some Hymenoptera, etc.

It would be interesting to know the different colors of the epidermis in such cases. So far as I know the change seems to be between related and not between complementary colors. But my observations are far from having any conclusive importance. The same investigation would be necessary for the hypodermal colors.

The hypodermal colors may change or be altered in some way in a male or female during its lifetime, by sexual or other influences. The epidermal colors never change. By sexual influenees yellow is changed into orange, brown into red, and even sometimes more changed. By other influences, for instance by cold in hibernation, pale yellow is changed into red (Chrysopa). The hypodermal colors can be changed even by a voluntary act of the animal, and the new colors disappear again (Cassida). The hypodermal colors are the only ones on which the animal has any influence either involuntarily by the action of the nutritive fluid or voluntarily. The epidermal cells are placed entirely outside of any influences of the animal, when once established. It will perperhaps be possible to prove that the so-called mimetic colors are all hypodermal colors.

The hypodermal colors seem to be produced by a photographic process (I know no better expression), the epidermal colors by a chemical process of combustion or oxidation. Would it be possible to prove that by a photographic process even the colors of the surrounding world could be transmitted, a great step towards an undertaking of the phenomena would be given. The fact of course is very probable, at least in some instances.

In observing the mimicry, the pattern of an insect must be clearly separated from the color. In fact the pattern is not the product of an accidental circumstance, but apparently the product of a certain law, or rather the consequence of certain actions or events in the interior of the animal and in its development. The proof is very easily afforded by the regularity of the pattern in a genus, or a family of insects. If studied carefully and comparatively the pattern in a genus is the same or is only more or less elaborated. The number of such families is so exceedingly great that some example will readily occur to every one.

Moreover a certain and constant pattern can be found for the head, a different pattern for the segments of the thorax, and a different pattern for the segments of the abdomen. This pattern is in the different segments of the abdomen (Hymenoptera, Diptera, Neuroptera, Orthoptera) always the same, only more or less elaborated, and less finished in the first and last segments. In some way the same is true for the thoracic segments.

In some few instances I was able to observe how the pattern is produced. In the Odonata (Dragon flies) at the moment of transformation the thorax is transparent, and shows no colors at all. At this time the muscles are without importance and in process of formation. The thoracic muscles as is well known are, in the Odonata, very powerful, and also very extraordinary as regards the shape of their tendons. Just along outside the muscles are dark lines more or less well finished, and resulting from the action of the muscles. *Ubi irritatio, ibi afluxus.* I believe that it would not be unphilosophical to conclude that a powerful action in the development of the muscles is in such a case the cause of a greater combustion or oxidation in the neighboring parts. In fact on the head of a Cicada, on the abdomen of an Æschna we find similar patterns, in some way mostly representing the underlying muscles. In the Gomphina the fact is striking and far more as the stronger species mostly possess a larger dark pattern. There are some very small species which are almost entirely yellow; there are no small species entirely black.

Should the fact, with the explanation, be admitted, a step farther in the explanation of the different patterns would be made. I know very well that in the Odonata there are patterns which do not agree with my explanations, even some contrary to it, but if some certain facts be explained, there are perhaps more factors still unknown or unobserved. The explanation given for certain facts would still be admissible, or at least not entirely objectionable.*

* So far as I know the literature relating to the phenomena of mimicry, all these related differences are often confused, and I believe that in separating them and following the views above given, many facts would be better understood and this interesting subject more easily advanced.

Besides all the difficulties which oppose a clear and correct view, there is one more which I do not find mentioned, *i. e.* the so called color-blindness and the different degrees of it. Prof. B. A. Gould in his excellent work "Investigations on Anthropological Statistics of American Soldiers" has given attention to it in a very remarkable chapter. Persons who cannot distinguish ripe cherries upon the tree, or strawberries

The patterns on the wings and elytra could not be the product of the action of muscles, but I believe it to be probable that the sudden rush of blood or even air, by the accelerated circulation and respiration in the act of transformation may have the same effect. In this way some patterns, otherwise not explicable, could be understood. The eyespots in the caterpillars of some Papilionidæ have been ascertained by Leydig to be epidermal colors, and I believe that the various kinds of eyespots in the wings of the imago are also epidermal colors. If a stream of blood meets a small obstacle just in the centre, a funnel is formed; if this obstacle is a ring, and behind it another obstacle we have two or more funnels, one in the other, and the section of them will be circular or elliptical according to the angle at which they reach the surfaces. Such patterns in the elytra and wings are formed or preformed at the time when the wing is a sac; sometimes before the transformation, and here is another circumstance which explains some patterns. The walls of the sac are suddenly augmented and strongly dilated in the transformation. Small patterns preformed in the sac will also be altered and enlarged by the same process, and I know that many patterns of Lepidopterous wings are in such a way very easily explained. All the waved lines of the wings and other marks belong here, and as the ribs or nervures seem to grow faster in transformation, the waved appearance would be explained. In fact the greater part of the patterns seem to be produced by expansions or distraction of the pattern preformed in the wing at some period before the transformation.

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on the vine by their color are far more numerous than would be suspected. Serious misunderstandings and even calamities have been reported in the army, resulting from mistakes in the color of green and red light by officers of the signal corps." He gives the statement that usually one in twenty, and in the soldiers examined one in fifty was subjected to color-blindness. But these numbers show only the extremes and it is easy to believe that a much greater number are more or less affected with it. In fact we have no means of measuring this physiological difference; if two persons call something green, and even compare the color with certain known objects there is no proof at all that they see just the same color. I think that it would be prudent in describing cases of mimicry, especially when they are extraordinary, not to forget that even the best observer may be unaware of this infirmity, and in fact the best authorities on color-blindness always state that the greater number of persons have no idea of their infirmity.

ORNITHOLOGICAL NOTES FROM THE WEST.

BY J. A. ALLEN.

III. NOTES ON THE BIRDS OF THE GREAT SALT LAKE VALLEY.

We arrived at Ogden, Utah, September 1st, and spent the following five weeks ornithologizing in the northeastern portion of the Great Salt Lake Valley. Although the vicinity of Ogden was the principal field of our operations, we made several excursions to the neighborhood of Salt Lake City, and to different points along the eastern shore of the lake. During this time we collected or observed nearly one hundred and forty species of birds, indicating for this locality a comparatively rich avian fauna. From the lateness of the season several of the summer birds had already migrated southward, among these Bullock's oriole and the white pelican. The latter, from its great abundance in summer, forms an interesting feature of the ornithology of the Great Salt Lake Valley. Other species were daily arriving from the mountains or from more northern districts.

The country about Ogden presents unusually varied conditions of locality and climate. The Wahsatch Mountains rise abruptly near the eastern shore of the lake, and some of the peaks are, even in summer, dotted with fields of snow. The broad expanse of water formed by the lake is bordered at intervals with extensive marshes, between which and the mountains stretches a broad arid plain. The willows and cottonwoods that fringe the rivers formerly constituted the only arborescent vegetation in the valley, but now extensive orchards and the numerous trees planted for shade and ornament furnish more favorable haunts for various woodland birds, which are every year increasing in number. While in the valley the summer is almost tropical, a journey of a few hours may take one to the alpine region of the mountains;— from the burning sands of the arid plain to fields of perpetual snow. There is thus as great a variety of localities and climate as can be often found in so limited an area.

The heat throughout the month of September was to us very oppressive, the temperature being that of a New England July; and no rain, it is said, had fallen for nearly four months. During

the first week of October the first snow of the season began to cover the higher parts of the mountains, extending lower with each successive storm, till on the 7th of the month their whole slopes were covered, and rain and sleet fell in the valley. The winds became cold and chilling, and winter seemed to have succeeded summer without the intervention of autumn. Such indeed this year was almost literally the case.

A little more than twenty years ago, as everybody doubtless knows, the Great Salt Lake Valley was entirely a desert, its characteristic vegetation being the "sage brush" and "grease wood," and such similar well-known plants as are found throughout the more excessively arid parts of the West. During the time that has since elapsed the mountain streams have been tapped by the industrious Mormon emigrants, and a portion of their waters conducted in ditches over the plains; thereby literally transforming the barren desert into fruitful fields. Considerable areas have thus been reclaimed, orchards and farms that rival in productiveness those of the most favored portions of our country replacing the repulsive sage brush and its kindred plants. These changes have of course greatly modified the fauna, increasing the number of all the smaller birds, but especially the granivorous and frugivorous kinds, whilst the influx of settlers has materially reduced the number of the water-fowl, although their abundance still forms the most characteristic ornithological feature of the region. Three species are reported to have been recently introduced, which give promise of multiplying rapidly and becoming thoroughly naturalized. These are the European house sparrow (*Passer domesticus*), the common eastern quail (*Ortyx Virginianus*), and the California quail (*Lophortyx Californicus*), all of which, as I was informed, had raised young the past season (1871).

With these general remarks I now pass to a hasty enumeration of the species that came under our observation; premising, however, that the only previous paper especially devoted to the ornithology of this region consists of a brief report by Professor Baird on the birds collected by Captain Stansbury's Expedition,* published in 1852, in which are mentioned thirty-one species.

Of the family of Thrushes, we obtained but four species — the robin, the catbird, mountain mockingbird and hermit thrush. The latter only came down from the mountains about October 1st,

* Stansbury's Expedition to the Great Salt Lake, pp. 314-325.

and we saw but few specimens, but the others were abundant. The robin was formerly rare, but being a general favorite with the settlers it has been carefully protected and seems to be annually increasing in numbers. The mountain mockingbird, familiarly known to the settlers as the "gray bird," is said to have similarly increased, but through its depredations on the smaller fruits—even the peach not escaping its ravages—it has become a proscribed race. The catbird we found as numerous in the thickets bordering the streams as we ever saw it in the East. The arctic bluebird is well known as a spring and autumn visitor, but seems to be most numerous in spring. The titlark (*Anthus Ludovicianus*) abounds at the same seasons, being first observed by us September 15th, though it probably breeds on the neighboring snowy summits of the Wahsatch Mountains. Of the *Sylvicolidæ* or wood-warblers, we collected about a dozen species. The Maryland yellow-throat, the summer yellowbird (*Dendræca æstiva*), and the yellow-breasted chat are probably common summer residents in the valley; the Blackburnian, Audubon's, the Nashville, the golden-crowned (*Helminthophaga celata*) Macgillivray's and the black-capped flycatching warblers, are all doubtless more or less common at the same season in the adjoining mountains. Nearly all were common in September in the vicinity of Ogden. The ruby-crowned kinglet became frequent about October 1st in the valley, as it had been previously in the mountains. The American ouzel (*Cinclus Mexicana*) was abundant along the mountain streams, and the rock wren was very numerous everywhere on the rocky declivities of the mountains about Ogden, above the upper terrace of the valley. The black-capped chickadee (*Parus atricapillus*, var. *septentrionalis*) was an abundant inhabitant of the willow thickets bordering the Ogden and Weber Rivers, and the reedy marshes were the favorite haunts of thousands of marsh wrens (*Cistothorus palustris*). All the swallows disappeared soon after our arrival; the most frequently observed species being the barn swallow, though the rough-winged and the violet-green were both frequently noticed during the first week of September. The nests of the cliff swallow seen adhering to the cliffs, especially in Weber and Echo Cañons, indicated that this species was also an abundant summer visitant. The red-eyed, warbling, and solitary vireos were all well represented and formed the only species of their family we saw. The cedar bird, the loggerhead shrike, and

the Louisiana tanager were each more or less frequent. The horned lark, so characteristic of the Plains, was also numerous.

The *Tyrannidæ* were well represented, the western race of the wood pewee being abundant, as were also two species of *Empidonax*, one being the western race of the yellow-bellied, and the other a representative of the least pewee of the East. The kingbird and the Arkansas flycatcher were also both frequently observed during the first half of September, and two specimens of the olive-sided pewee were taken.

The great family of the sparrows and finches (*Fringillidæ*) was represented by eighteen species, the greater part of which were common. One half are strictly western, while the others are common species in the Atlantic States. Among the latter were the bay-winged, savanna, the yellow-winged, chipping, song and Lincoln's sparrows, the common gold-finch or yellow bird, and the purple finch, all but the last named being either common or exceedingly abundant. Of the western species, the western white crowned, or Gambel's sparrow, appeared in the valley in great numbers about September 15th; a few specimens of the slate-colored sparrow (*Passerella "schistacea"*) were seen at about the same date, and the Oregon snowbird became common towards the close of the month. Bell's sparrow (*Poospiza Bellii*) was rather numerous on the dry plains, keeping on the ground among the sage brush. The western gold-finch (*Chrysomitris psaltria*) was also quite numerous, associating freely with the common species; and a few specimens of the lazuli finch were also taken. The arctic towhee (*Pipilo "arcticus"*) was an abundant inhabitant of the thickets, in habits strongly resembling the common towhee of the East; though its song is somewhat similar to that of the eastern bird, its call note is totally different, quite nearly resembling the call note of the catbird. Blanding's finch (*Pipilo chlorurus*) began to appear in numbers about September 20th, from its breeding haunts in the mountains. The clay-colored sparrow (*Spizella pallida*) was generally found in company with the chipping sparrow, and was almost equally abundant. The black-headed grosbeak is a summer resident, but like its eastern congener, the rose-breasted, departs early for the south, and had already migrated when we arrived. It is well known as the "Pea-bird," from its fondness for green peas, of which it is so destructive that it is considered an obnoxious species.

The *Icteridæ*, or blackbirds, grackles and their allies, were represented by five or six species, of which three, the yellow-headed, red-winged and Brewer's, occurred in immense numbers. The yellow-headed and red-winged live in the marshes, from which at this season they make excursions in great flocks over the neighboring country, by their voracity and numbers causing no little loss to the farmers, by destroying the ripening corn. The Brewer's blackbird, though less an inhabitant of the marshes, to a considerable extent associates with them, and is only less destructive because less numerous. The immense flocks of these associated species bring vividly to mind the descriptions of Wilson and others of the hordes of red-wings and grackles that occur in autumn and winter in the more southern portions of the Atlantic States. The meadow lark is the next most abundant species of this group. The cowblackbird, though perhaps occurring, was not observed, but to our great surprise the bobolink was quite frequent. Bullock's oriole is also a common summer resident, taking the place of our familiar Baltimore of the East.

Among the *Corvidæ*, the raven and the magpie were both common, the latter near the streams and the former more generally distributed; the great-crested, Woodhouse's and the Canada jays were of frequent occurrence in the mountains, the former being familiarly known as the "mountain jay." The common crow is said also to be common, but it escaped our notice.

Nuttall's whippoorwill was abundant on the lower parts of the mountains, and we heard scores of them near the mouth of Ogden Cañon on several occasions, after nightfall. Though so numerous, all our efforts to procure specimens were futile, as it did not usually manifest its presence till after it became too dark for it to be clearly distinguished. We saw the last one October 7th, during a severe snow-storm on the mountains north of Ogden, the snow having already accumulated to the depth of several inches. The snow had probably surprised the bird as much as its own presence under such peculiar circumstances did us. The night hawk and the broad-tailed humming bird were both common through the greater part of September, and the kingfisher is doubtless a common resident throughout the year.

The woodpeckers, owing to the scarcity of woodland, were sparsely represented. Only two species were noticed, one of which, apparently the downy woodpecker, was seen once, and the

other, the red-shafted, was only moderately common. Its evident habit here of sometimes breeding in banks, in the absence of suitable trees, has already been mentioned.* The only owls noticed were the burrowing (*Athene hypogæa*), which in the absence of the prairie dogs lives in the holes of coyotes; and one specimen of the long-eared owl; the great horned owl is said to be of frequent occurrence, especially in the winter. The marsh hawk was abundant, and often seen swooping down over the marshes at the blackbirds, but, generally unsuccessfully, the blackbirds rising in clouds before it with a heavy noise not unlike low distant thunder, soon to settle again in another part of the marsh. The pigeon hawk and the duck hawk were both frequent, the latter preying upon the water fowl. A ruddy duck, struck down and killed by one of these birds, was added one day to our game bag and made a good specimen and the hawk narrowly escaped the same fate. The sparrow hawk, however, was by far the most numerous of the *Falconidæ;* thirty were seen in the air at one time near the mouth of Weber Cañon, engaged in the capture of the "hateful grasshopper" (*Caloptenus spretus* Uhler), which everywhere filled the air, and which seems at this season to form the principal food of this and other birds. The red-tailed hawk, and the golden and white-headed eagle were more or less frequent, and the fish hawk is said to be a rather common summer resident. The turkey vulture was also common.

The Carolina dove was abundant, and is said to breed here, also, generally on the ground.† But few grouse were seen, though evidence was obtained of the presence of four species;—the dusky and the ruffed grouse (*Tetrao obscurus* and *Bonasa umbellus*) in the mountains, and the sage cock and the sharp-tailed on the plains, specimens of the last two being obtained. The sage cock and the sharp-tailed grouse were formerly very abundant, but this year we saw only about a dozen of each, and were informed that it never was known to be so scarce here before.

Of the plovers, the killdeer was the only one seen, and was exceedingly abundant. About a dozen species of *Scolopacidæ* were obtained, of which the greater part were numerously represented.

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*This Journal, May, p. 274.

† Prof. O. C. Marsh has informed me that he "can confirm my statement [in the May NATURALIST] that the Carolina dove *breeds on the ground*. In Western Kansas and in Colorado," he adds "I have often found the eggs, and young on the ground. Once I flushed a female who was covering a couple of very young birds on the ground,—not in a nest but in a small depression *on the bare ground*."

Wilson's snipe was so abundant that Mr. Bennett bagged fourteen in the space of a few hours. The red-breasted sandpiper became common after September 25th. The greater yellow-legs and the red-backed sandpiper were also common; whilst the spotted, solitary and least sandpipers and the lesser yellow-legs were only occasionally met with. Wilson's phalarope, the avocet, and the black-necked stilt were abundant and characteristic birds, being summer residents and breeding abundantly on the islands and shores of Salt Lake. The last two are called "white snipes!" Of the avocet we saw flocks of thousands on the sand bars and mud flats at the mouth of Weber River. The glossy ibis (called "black snipe!") is now a common summer bird, but we were assured it had only made its appearance here during the last few years. The white ibis seems to be also a common summer species, which we saw, however, but once; and the greater part of the glossy ibises had migrated before our arrival. Of the seven specimens seen we obtained five, although we found it an excessively wary bird.

Of herons we saw the great blue, and obtained the night heron and the bittern, all of which were tolerably common; and cranes are said to occur in abundance in spring and fall. Of rails, the Virginia, the Carolina, and the marsh hen (*Rallus elegans*) were apparently the most common, though few of either were seen. The mud-hen or coot, however, was found in all the ponds and lagoons in great numbers.

The abundance of the swimming birds is even now almost incredible, though they are far less numerous and much more wary than formerly. Thirteen species of ducks were obtained without special effort, all of which were common, and about one-third were abundant, as follows:—the pintail, green-winged teal, red-breasted teal, gadwall and red-head were each abundant, whilst the mallard, shoveller, widgeon, wood duck, scaup duck, ruddy duck and goosander were common. The Canada goose was also numerous, and the snow goose or "white-brant" began to arrive in considerable numbers about October 1st. Two species of grebe were also noticed, the horned and the Carolina, the latter being abundant. Three species of *Laridæ* were obtained, two of which were seen only after about October 1st. These were the Sabine's gull, of which but a single specimen was either taken or seen, and Bonaparte's gull. The three adult specimens taken of the latter

differ from the eastern representatives of that bird in having a much shorter, thicker and less decurved bill. The Delaware gull, or its western representative, is a numerous summer resident, breeding on the islan!s in great numbers. At the time of our visit these birds spent much of their time on the sand bars of the Weber River, below Weber Cañon, and at certain hours of the day rose into the air to feast on the grasshoppers, on which they seemed at this time almost wholly to subsist. The stomachs of those we killed were not only filled with them, but some had stuffed themselves so full that the grasshoppers could be seen on opening their mouths. But what seems most singular is the fact that they capture them in the air (not by walking over the ground, as has been stated), sailing around in broad circles as though soaring merely for pleasure, seizing the flying grasshoppers with the same ease that a swallow exhibits in securing its prey of smaller insects while in rapid flight, but of course with far less gracefulness of motion.

Two other interesting birds found here are the double-crested cormorant and the white pelican, the former bearing the singular local name of "black brant!" We saw the cormorants only on Weber River, but, according to Stansbury, they breed on the islands with the gulls and pelicans. The pelicans leave for the south towards the end of August or early in September. Although we saw no live ones, we found one on our first arrival that had been killed but a few days before by gunners. Concerning the abundance of this and other species of water-fowl on the islands during his survey of the Great Salt Lake, Captain Stansbury, under date of Gunnison's Island, May 8th, 1850, writes as follows:—

"The whole neck and the shores on both of the little bays were occupied by immense flocks of pelicans and gulls, disturbed now for the first time, probably, by the intrusion of man. They literally darkened the air as they rose upon the wing, and, hovering over our heads, caused the surrounding rocks to reëcho with their discordant screams. The ground was thickly strewn with their nests, of which there must have been some thousands. Numerous young, unfledged pelicans, were found in the nests on the ground, and hundreds half-grown, huddled together in groups near the water, while the old ones retired to a long line of sand-beach on the southern side of the bay, where they stood drawn up, like Prussian soldiers, in ranks three or four deep, for hours together, apparently without motion. . . We collected as many eggs as we could carry. That of the gull is of the size of a hen's egg, brown and

spotted; that of the pelican is white, and about as large as a goose egg." (Stansbury's Report, p. 179.)

Again, on page 188, under date of Antelope Island, May 20th, Captain Stansbury observes:—

"Before we passed around the point of Antelope Island, we stopped for a few moments at the little islet near it, where the number of gulls and pelicans was, if possible, greater than we had seen on Gunnison's Island. The whole islet was covered with eggs, chiefly those of gulls, and with innumerable young birds, just hatched, the most of which on our appearance instinctively concealed themselves among the crevices of the rocks, while the parent birds, in countless numbers, anxiously hovered over us, filling the air with their discordant cries. Some young herons and cormorants were also found amid the colony of gulls — the former fierce and full of fight, the latter timid and alarmed, running from their nests to the water, where they endeavored to conceal themselves by persevering but abortive attempts to dive. We filled half a barrel with the eggs, but most of them proved to be bad."

The waters of the Salt Lake, of course, afford these birds no food. That of the pelican, says Stansbury (p. 193), "consists entirely of fish, which they must necessarily obtain either from Bear River, from the Weber, the Jordan, or from the Warm Springs on the eastern side of Spring Valley, at all of which places they were observed fishing for food. The nearest of these points is more than thirty miles distant, making necessary a flight of at least sixty miles to procure and transport food for the sustenance of their young."

In concluding these brief notes on the birds of the West, a few general observations may be added. Probably every observing collector who has had the opportunity of studying birds in their native haunts at widely separated localities has noticed differences in the songs or notes of birds of the same species at distant points in the common habitat of the species. My own experience has been that at southern localities, the songs of certain species are abbreviated, and generally uttered with less energy than at the north. In other cases, garrulous birds, like the jays and some others, have certain common notes at some localities not heard at all at others, when in color or other features they differ but slightly, if at all, there being as it were local dialects in their respective languages. On the other hand, the songs of species that differ widely in color, are sometimes so closely similar as almost to defy the most discriminating ear to detect the species by their songs,

though some of their call notes may be quite different. At other times they differ in habits, especially in respect to the situation and form of the nest, the same species at some localities breeding always on trees and at others almost as uniformly on the ground, in cases where the identity of the species is admitted by every ornithologist. In like manner some that at some localities build domed nests, at others build an open nest; others vary from a somewhat elaborate bulky nest, to a much simpler and more slight one; whilst in all cases the material varies in accordance with the respective abundance of whatever may be most suitable to the wants or habits of the species. Thus, on the Plains, many species line their nests with the soft hair of the buffalo in place of the down from certain plants they are accustomed to choose at other localities.

The question of the occurrence of supposed hybridity among certain of the birds of the West is one of constantly increasing interest. The facts of the case are simply these:— that between several congeneric but widely diverse forms occur individuals over the region where the habitats of the two adjoin, which combine in varying degrees the characteristics of both forms. These individuals have been generally supposed to be hybrids between the forms they respectively resemble, but whether such or not, in a technical sense, they are evidently fertile with either of the original forms, and also among themselves. Furthermore, that on either side of the area of "hybridity," either form exhibits in varying degrees an admixture of the characters of the other, the degree lessening on either hand over an area of usually several hundred miles in breadth, till each form assumes nearly constantly its maximum divergence from the other. Such in general is the nature of what I have termed longitudinal variation, or the differentiation of conspecific forms at localities differently situated in respect to longitude. Similar differentiation occurs at localities differing in latitude, which hybridity has never been assumed to explain, though it is difficult to see why it should not be called in as well in the one case as in the other. In each case we have a similar gradual differentiation over extensive areas. Hybridity has been generally regarded as an unfailing test of specific diversity, but here one of two things must be assumed:— either that hybridity fails as a test of specific diversity, or else that these widely differing congeneric forms are only geographical modifications of the same

species, resulting from at present only partially known laws of climatic influence. To the latter I incline as being the most rational and the best supported by analogy and by facts.*

NOTE.—In the article on the Birds of Colorado, in the June number of this Journal, I omitted to add that several specimens of the white-throated wren (*Catherpes Mexicanus*) were obtained near Colorado City, where it was a common species. This is the first time, apparently, that this species has been reported from any point within the United States east of Southern Nevada (*Ridgway*). It possesses a voice of wonderful strength and penetration for so small a bird, and seemed to delight in the startling echoes it awakened among the high cliffs of the "Garden of the Gods."

On page 350, June number of this Journal, it was stated that *Chamea fasciata* was apparently common near Colorado City. As it has been heretofore known only from the extreme southwestern portions of the United States, I should perhaps add that no specimens were taken, but as I was within a few yards of it on a number of occasions, I cannot doubt the correctness of the observation.

I take this opportunity of correcting the following *errata*: On page 345, line 12, *read* chipping *for* "nipping;" p. 347, line 28, read *Selasphorus* for "*Selasophorus*;" p. 350, line 3, read *tephrocotis* for "*griseinucha*;" p. 351, line 6, read *Actodromas Bairdii* for "*Pelidna Americana*."

VISIT TO THE ORIGINAL LOCALITY OF THE NEW SPECIES OF ARCEUTHOBIUM IN WARREN COUNTY, N. Y.

BY C. C. PARRY, M.D.

HAPPENING to spend a few days in the vicinity of Glen's Falls, N. Y., I concluded to improve the opportunity of visiting the locality of the newly discovered species of *Arceuthobium* (*A. minutum* Engel. ined.) parasitic on *Abies nigra*.

I accordingly called on Mrs. Lucy Millington of the above place, to obtain the desired information as to the precise locality where it was first found. It is to this lady that the botanical world is indebted for the discovery of this interesting addition to the Flora of New York. Mrs. Millington's first specimens were collected on the 10th of August, 1871,† and were then recognized by her as a distinct parasite of which she could find no account in any of the botanical works at her command. Specimens were accordingly

*On climatic variation see Bull. Mus. Comp. Zoöl., Vol. ii, No. 3, and Vol. iii, No. 6, where the subject is further discussed, and where most of the facts on which the above remarks are based are given in detail.

†A brief record of Mrs. Millington's discovery has been given on page 166 of this volume of the NATURALIST.—Eds.

transmitted to Mr. Leggett of the Torrey Botanical Club of N. Y., where it was first brought to the notice of Dr. Torrey. Later in the season the same species was also found by Mr. Peck, in a peat marsh near Sand Lake in the vicinity of Albany, N.Y. Subsequently Mrs. Millington collected and transmitted numerous specimens in different stages of growth, from the original locality in Warren Co., N. Y., to Dr. Engelmann of St. Louis, who has been engaged for some time, in working up a monograph of the North American Species of *Arceuthobium*.

For the benefit of future explorers of the botany of this northern district, I cannot do better than indicate the exact locality of this interesting plant as first pointed out by Mrs. Millington, viz.:— About two miles north of Warrensburg, Warren Co., N. Y., following the plank road leading to Chester, you pass on the right hand (east) of the road, an extensive marshy track, which on penetrating a narrow belt of timber, opens up into a wide sphagnous swamp occupied with occasional clumps of Samarack, and bordered by low stunted growths of black spruce (*Abies nigra*). Here the plant in question may be found without difficulty, the first indication of its presence being observable in distorted branches showing at their extremity a massed growth of finely divided spray, having a somewhat faded foliage. These masses will, on closer inspection, reveal the minute parasite, occupying the upper or thrifty growing branches. Of other points worthy of mention, I may note briefly.

1st. The period of flowering (different from most other species of the genus) is in spring. At the time of my visit, May 14th, the male blossoms were fully opened and the pollen mostly shed; the female flowers also well developed.

2d. As far as my observation goes, the plant is strictly diœcious, males and females occupying separate trees: not even occurring on different branches of the same tree. The male plants seem to be most frequent, though female plants are not rare.

3d. The parasitic growth, whether male or female, seems to persist on the same branch extending upwards, year by year on the thrifty growing branches; leaving only the scars of previous growths on the lower portions of the limb; the distortion being evidently due to this cause.

4th. Neither male nor female plants persist beyond the period

of flowering, or perfecting their seed, after which the minute shoots (seldom an inch in length and very rarely branched) drop off, leaving a persistent cup-shaped base.

The technical characters of this species will be fully developed in Dr. Engelmann's forthcoming monograph of the genus.

ON THE WYANDOTTE CAVE AND ITS FAUNA.

BY PROF. E. D. COPE.

The Wyandotte Cave traverses the St. Louis Limestone of the carboniferous formation in Crawford County in south western Indiana. I do not know whether its length has ever been accurately determined, but the proprietors say that they have explored its galleries for twenty-two miles, and it is probable that its extent is equal to that of the Mammoth Cave in Kentucky. Numerous galleries which diverge from its known courses in all directions have been left unexplored.

The readers of the Naturalist have freshly in their memories the interesting papers of Messrs. Packard and Putnam on the fauna of the Mammoth Cave and related species. The writer accompanied the excursion so pleasantly described in the Naturalist, and obtained most of the species there enumerated as well as two or three additional ones which will be mentioned at the close of this article. On returning to Indianapolis at the request of Prof. E. T. Cox, state Geologist of Indiana, I made an examination of the Wyandotte Cave, so far as two days' exploration could be called such. Having prepared my report, I present a portion of it, by permission of Prof. Cox, to the Naturalist.

The Wyandotte Cave is as well worthy of popular favor as the Mammoth. It lacks the large bodies of water which diversify the scene in the latter, but is fully equal to it in the beauty of its stalactites and other ornaments of calcite and gypsum. The stalactites and stalagmites are more numerous than in the Mammoth, and the former frequently have a worm or maccaroni-like form, which is very peculiar. They twist and wind in masses like

the locks of Medusa, and often extend in slender runners to a re-remarkable length. The gypsum rosettes occur in the remote regions of the cave and are very beautiful. There are also masses of amorphous gypsum of much purity. The floor in many places is covered with curved branches, and, what is more beautiful, of perfectly transparent acicular crystals, sometimes mingled with imperfect twin-crystals. The loose crystals in one place are in such quantity as to give the name of "Snow Banks" to it. In other places it takes the form of japanning on the roof and wall rock.

In one respect the cave is superior to the Mammoth—in its vast rooms, with step-like domes, and often huge stalagmites on central hills. In these localities the rock has been originally more fractured or fragile than elsewhere, and has given way at times of disturbance, piling masses on the floor. The destruction having reached the thin-bedded strata above, the breaking down has proceeded with greater rapidity, each bed breaking away over a narrower area than that below it. When the heavily-bedded rock has been again reached, the breakage has ceased, and the stratum remains as a heavy coping stone to the hollow dome. Of course the process piles a hill beneath, and the access of water being rendered more easy by the approach to the surface, great stalactites and stalagmites are the result. In one place this product forms a mass extending from floor to ceiling, a distance of thirty or forty feet, with a diameter of twenty-five feet, and a beautifully fluted circumference. The walls of the room are encrusted with cataract-like masses, and stalagmites are numerous. The largest room is stated to be 245 feet high and 350 feet long, and to contain a hill of 175 feet in height. On the summit are three large stalagmites, one of them pure white. When this scene is lit up, it is peculiarly grand to the view of the observer at the foot of the long hill, while it is not less beautiful to those on the summit. There is no room in the Mammoth Cave equal to these two.

I must not omit to mention the kind attention to the wants of his guests constantly displayed by Mr. Conrad, the present proprietor of the hotel, and the equally useful guidance of Mr. Rothrock, the owner of the cave. Visitors will also find on their way thither an American Auerbach's hotel at Leavenworth, near the steamboat landing. This excellent house is not haunted, like its European predecessor at Leipsic, by either a Mephistophiles or a Faust, but by a landlord (Mr. Humphreys), whose charges are

low, and whose wife knows how, in lodgings and table, to satisfy reasonably fastidious persons.

An examination into the life of the cave shows it to have much resemblance to that of the Mammoth. The following is a list of sixteen species of animals which I obtained, and by its side is placed a corresponding list of the species obtained by Mr. Cooke and others at the Mammoth Cave. These number seventeen species. As the Mammoth has been more frequently explored, while two days only were devoted to the Wyandotte, the large number of species obtained in the latter, suggests that it is the richer in life. This I suspect will prove to be the case, as it is situated in a fertile region. Some of the animals were also procured from caves immediately adjoining, which are no doubt connected with the principal one.

Of the out-door fauna which find shelter in the cave, bats are of course most numerous. They are probably followed into their retreat by the eagle and other large owls. The floors of some of the chambers were covered to a considerable depth by the castings of these birds, which consisted of bats' fur and bones. It would be worth while to determine whether any of the owls winter there.

I believe that wild animals betake themselves to caves to die, and that this habit accounts in large part for the great collections of skeletons found in the cave deposits of the world. After much experience in wood craft, I may say that I never found the bones of a wild animal which had not died by the hand of man, lying exposed in the forest. I once thought I had found the place where a turkey vulture (*Cathartes aura*) had closed its career, on the edge of a wood, and it seemed that no accident could have killed it, the bones were so entire as I gathered them up one by one. At last I raised the slender radius; it was broken, and the only injured bone. I tilted each half of the shaft, and from one rolled a single shot! The hand of man had been there. One occasionally finds a mole (*Scalops* or *Condylura*) overcome by the sun on some naked spot, on his midday exploration, but if we seek for animals generally, we must go to the caves. In Virginia I found remains of very many species in a recent state; in a cave adjoining the Wyandotte I found the skeleton of the gray fox *Vulpes Virginianus*. In a cavern in Lancaster Co., Pennsylvania, in an agricultural region, I noticed bones of five or six *Cistudines*, as many rabbits, and a few other wild species, with dog, horse, cattle, sheep, etc., some of which had fallen in.

LIST OF LIVING SPECIES IN THE TWO CAVES.

WYANDOTTE.	MAMMOTH.
	Vertebrata.
Amblyopsis spelæus DeKay.	Amblyopsis spelæus DeKay. Typhlichthys subterraneus Girard.
	Arachnida.
Erebomaster flavescens Cope.	Acanthocheir armata Tellk. Phrixis longipes Cope.
Anthrobia.	Anthrobia monmouthia Tellk.
	Crustacea.
Orconectes inermis Cope. Cæcidotea microcephala Cope. Cauloxenus stygius Cope.	Orconectes pellucidus Tellk. Cæcidotea stygia Pack. Stygobromus vitreus Cope.
	Insecta.
Anophthalmus tenuis Horn. Anophthalmus eremita Horn. Quedius spelæus Horn. Leteva sp. nov. Horn. Raphidophora. Phora. Anthomyia. Machilis. Campodea sp. Tipulid.	Anophthalmus Menetriesii Motsch. Anophthalmus Tellkampfii Erichs. Adelops hirtus Tellk. Raphidophora subterranea Scudd. Phora. Anthomyia. Machilis. Campodea Cookei Pack.
	Myriopoda.
Spirostrephon cavernarum Cope.	Scoterpes Copei (Pack.).

The blind fish of the Wyandotte Cave is the same as that of the Mammoth, the *Amblyopsis spelæus* DeKay. It must have considerable subterranean distribution, as it has undoubtedly been drawn up from four wells in the neighborhood of the cave. Indeed, it was from one of these, which derives its water from the cave, that we procured our specimens, and I am much indebted to my friend N. Bart. Walker, of Boston, for his aid in enabling me to obtain them. We descended a well to the water, some twenty feet below the surface, and found it to communicate by a side opening, with a long low channel, through which flowed a lively stream of very cool water. Wading up the current in a stooping posture, we soon reached a shallow expansion or pool. Here a blind crawfish was detected crawling round the margin, and was promptly consigned to the alcohol bottle. A little further beyond, deeper water was reached, and an erect position became possible, We drew the seine in a narrow channel, and after an exploration under the bordering rocks secured two fishes. A second haul secured another. Another was seen, but we failed to catch it, and on emerging from the cave I had a fifth securely in my hand, as I thought, but found my fingers too numb to prevent its freeing itself by its active struggles.

If these Amblyopses be not alarmed, they come to the surface

to feed, and swim in full sight like white aquatic ghosts. They are then easily taken by the hand or net, if perfect silence is preserved, for they are unconscious of the presence of an enemy except through the medium of hearing. This sense is, however, evidently very acute, for at any noise they turn suddenly downward and hide beneath stones, etc., on the bottom. They must take much of their food near the surface, as the life of the depths is apparently very sparse. This habit is rendered easy by the structure of the fish, for the mouth is directed partly upwards, and the head is very flat above, thus allowing the mouth to be at the surface. It thus takes food with less difficulty than other surface feeders, as the perch, etc., where the mouth is terminal or even inferior; for these require a definite effort to elevate the mouth to the object floating on the surface. This could rarely be done with accuracy by a fish with defective or atrophied visual organs.* It is therefore probable that fishes of the type of the *Cyprinodontidæ*, the nearest allies of the *Hypsæidæ*, and such *Hypsæidæ* as the eyed *Chologaster*, would possess in the position of the mouth a slight advantage in the struggle for existence.

The blind crawfish above mentioned is specifically distinct from that of the Mammoth Cave, though nearly related to it. Its spines are everywhere less developed, and the abdominal margins and cheles have different forms. I call it *Orconectes inermis*, separating it generically from *Cambarus*, or the true crawfishes, on account of the absence of visual organs. The genus *Orconectes*, then, is established to include the blind crawfishes of the Mammoth and Wyandotte Caves. Dr. Hagen, in his monograph of the American Astacidæ, suspects that some will be disposed to separate the *Cambarus pellucidus* as the type of a special genus, but thinks such a course would be the result of erroneous reasoning. Dr. Hagen's view may be the result of the objection which formerly prevailed against distinguishing either species or genera whose characters might be suspected of having been derived from others by modification, or assumed in descent. The prevailing views in favor of evolution will remove this objection; and for myself I have attempted to show† that it is precisely the structural characters which are most obviously, and therefore most lately, assumed

*Mr. Putnam's objection to my reasoning from the structure of the Amblyopsis' mouth was based on a misconception of my meaning. The above explains the point more fully.

† Origin of Genera, p. 41.

on which we have been in the habit of depending for discrimination of genera. The present is a case in point. So far also as the practice of naturalists goes, this course is admissible, for the presence or absence as well as the arrangement of the eyes have long been regarded as generic indications among the Myriopoda and Arachnida. Without such recognition of a truly structural modification our system becomes unintelligible.

Dr. Packard described in his article already quoted, an interesting genus of Isopoda allied to the marine form *Idotæa*, which Mr. Cooke discovered in a pool in the Mammoth Cave. He called it *Cæcidotea*. I obtained a second species, in a cave adjoining the Wyandotte, which differs in several important respects. The head is smaller and more acuminate, and the bases of the antennæ are more closely placed than in *C. stygia* Pack. I call it *Cæcidotea microcephala*. Both species are blind. The new species is pure white. It was quite active, and the females carried a pair of egg pouches full of eggs. The situation in which we found it was peculiar. It was only seen in and near an empty log trough used to collect water from a spring dripping from the roof of one of the chambers.

Fig. 109.

Cæcidotea microcephala Cope, magnified 6.5 times.

The Lernæan, *Cauloxenus stygius* Cope, is a remarkable creature. It is a parasite on the blind fish, precisely as numerous species near of kin, attach themselves to various species of marine fishes. The Wyandotte species is not so very unlike some of these. It is attached by a pair of altered fore-limbs, which are plunged into the skin of the host and held securely in that position by the barbed or recurved claws. The position selected by the blind fish Lernæan, was the inner edge of the upper lip, where she hung in a position provocative of attempts at mastication on the part of the fish and reminding one of the picture of the man on the ass' back holding a fork of fodder before the animal's nose, in illustration of the motto that "persuasion is better than force." The little creature had an egg pouch suspended on each side, and was no doubt often brought in contact with the air by her host.

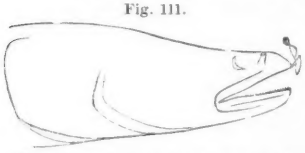
Fig. 110.

Cæcidotea microcephala Cope. The mandible and palpi of right side more enlarged. The outer palpus lies above the lateral plate, and its origin was not seen.

This position would not appear to be a favorable one for long life, as the body of the *Cauloxenus* would be at once caught

between the teeth of the fish, should its direction be reversed or thrown backwards. The powerful jaw-arms, however, maintained like a steel spring a direction at a strong angle with the axis of the body, which was thrown upwards over the upper lip, the apex of the cephalothorax being between the lips of the fish. This position being retained, it becomes a favorable one for the sustenance of the parasite, which is not a sucker or devourer of its host, but must feed on the substances which are caught by the blind fish, and crushed between its teeth. The fragments and juices expressed into the water must suffice for the small wants of this crustacean.

Fig. 111.



Caulaxenus stygius in position on the lip of *Amblyopsis spelæus*, enlarged.

But if the supply of food be precarious, how much more so must be the opportunities for the increase of the family. No parasitic male was observed in the neighborhood of the female, and it is probable that as in the other *Lernæopodidæ*, he is a free swimmer, and extremely small. The difficulty of finding his mate on an active host-fish must be augmented by the total darkness of his abode, and many must be isolated owing to the infrequent and irregular occurrence of the fish, to say nothing of the scarceness of its own species.

Fig. 113.

Caulaxenus stygius. Antennal processes and muzzle more enlarged.

The allied genera, *Achtheres* and *Lernæopoda*, present very distinct distributions, the former being fresh water and the latter marine. *Lernæopoda* is found in the most varied types of fishes and in several seas; *Achtheres* has been observed on perch from Asia and Europe, and on a South American *Pimelodus*. It is to the latter that *Caulaxenus* is most nearly allied, and from such a form we may perhaps trace its descent; modification being consequent on its wandering into subterranean streams. The character which distinguishes it from its allies, is one which especially adapts it for maintaining a firm hold on its host, *i. e.* the fusion of its jaw-arms into a single stem.

Fig. 112.

Caulaxenus stygius. The animal viewed from below, with an infero-lateral view of the cephalothorax.

Whether the present species shared with the *Amblyopsis* its history and changes, or whether it seized upon the fish as a host at some subsequent period, is a curious speculation. Its location

at the mouth of the fish could scarcely be maintained on a species having sight, for if the host did not remove it, other individuals would be apt to.

I may here allude to another blind Crustacean which I took in the Mammoth Cave, and which has been already mentioned in the Annals and Magazine of Natural History as a Gammaroid. Mr. Cooke and myself descended a hole, and found a short distance along a gallery, a clear spring covering, perhaps, an area ten feet across. Here Mr. Cooke was so fortunate as to procure the *Cæcidotea stygia*, while I took the species just mentioned, and which I name *Stygobromus vitreus*. The genus is new and represents in a measure the *Niphargus* of Schiödte found in the caves of Southern Europe. It resembles, however, the true *Gammarus* more closely, by characters pointed out at the close of this article. This genus has several species in fresh waters, which are of small size, and swim actively, turning on one side or the other.

Of insects I took four species of beetles, all new to science. Two of them of the blind carnivorous genus *Anophthalmus*, and two *Staphylinidæ*, known by their very short wing-cases and long, flexible abdomen. Dr. Geo. H. Horn has kindly determined them for me. One of them, the *Quedius spelæus* Horn, is a half-inch in length, and has rather small eyes.* It was found not far from the mouth of the cave. Dr. Horn furnishes me with the following list of Coleoptera from the two caves in question:

Anophthalmus Tellkampfii Erichs.	Mammoth Cave.	
" Menetrie-i Motsch. *angulatus* Lec.	Mammoth Cave.	
" eremita Horn.	Wyandotte Cave.	
" tenuis Horn.	Wyandotte Cave.	
" striatus Motsch.	Mammoth Cave.	Unknown to me.
" ventricosus Motsch.	Mammoth Cave.	Unknown to me.
Adelops hirta Tellk.	Mammoth Cave.	

These are the only true cave insects at present known in these faunæ. Other species were collected within the mouths of the caves, but which cannot be classed with the preceding, as cave insects proper.

Catops n. sp.?	Wyandotte Cave.
Quedius spelæus Horn.	Wyandotte Cave.
Le-teva n. sp.	Wyandotte Cave.

And another Alæocharide Staphylinide, allied to Tachyusa, also from Wyandotte Cave. No names have as yet been given to

*See Proceed. Amer. Entom. Soc., 1871, p. 332.

any of these excepting the second. A monograph of Catops has already appeared containing many species from our fauna, and as the work is inaccessible at present, I have hesitated to do more than indicate the presence of the above species.

The cricket of the Wyandotte Cave is stouter than that of the Mammoth and thus more like the *Raphidophora lapidicola* of the forest. There were three species of flies, one or more species of *Poduridæ* and a *Campodea* not determined.

Centipedes are much more abundant in the Wyandotte than in the Mammoth cave. They especially abounded on the high stalagmites which crown the hill beneath the Mammoth dome, which is three miles from the mouth of the cave. The species is quite distinct from that of the Mammoth Cave and is the one I described some years ago from caves in Virginia and Tennessee. I call it *Spirostrephon cavernarum*, agreeing with Dr. Packard that the genus* to which it was originally referred is of doubtful validity. The species is furnished with a small triangular patch of eyes, and is without hairs, but the antennæ are quite elongate. Its rings are quite handsomely keeled. The allied form found by Mr. Cooke in the Mammoth Cave has been described by Dr. Packard as *Spirostrephon Copei*. It is eyeless and is, on this account alone, worthy of being distinguished generically from *Spirostrephon*, though the absence of pores asserted by Dr. Packard, would also constitute another character. *Spirostrephon* possesses a series of lateral pores as I have pointed out in accordance with Wood's view.† This genus may be then named *Scoterpes*. I look for the discovery of *S. cavernarum* in the Mammoth Cave.

Two species of Arachnidans were observed, one a true spider, the other related to the "long-legs" of the woods. A species similar to the former is found in the Mammoth Cave, and others in other caves, but in every instance where I have obtained them, they have been lost by the dissolution of their delicate tissues in the impure alcohol. The other forms are more completely chitinized and are easily preserved. They are related to the genus *Gonyleptes* found under stones in various portions of the country. Dr. Wood describes a species from Texas, and I have taken them in Tennessee and Kansas. In the Wyandotte Cave I found a number of individuals of a new species at a place called the screw hole.

* *Pseudotremia.*

† Proceed. Amer. Entom. Soc. 1870.

This is a narrow passage between masses of rock, which rises from the end of a gallery to the floor of a large room called the senate chamber. Though living at a distance of four or five miles from the mouth of the cave, this species is furnished with eyes. Its limbs are not very long, but its palpi are largely developed, and armed with a double row of long spines pinnately arranged, like its relative of the Mammoth Cave, the *Acanthocheir*. This species is described at the end of the article as *Erebomaster flavescens* Cope. In its relationships it may be said to stand between *Acanthocheir* and *Gonyleptes*.

Fig. 114.

Erebomaster flavescens, magnified 7.6 times.*

Besides *Acanthocheir*, another blind Gonyleptid exists in the Mammoth Cave, which I found several miles from the mouth. It is blind like the former, but differs in having many more joints to the tarsi, approaching thus the true *Phalangia*, or long-legs. There are six joints and terminal claws, while *Acanthocheir* is said to have two and *Erebomaster* three joints. It is larger than *A. armata*, and has much longer legs. Its palpi are also longer and their spines terminate in long hairs. I have named it *Phrixis longipes*.

Dr. Packard and Mr. Putnam have already discussed the question of the probability of the origin of these blind cave animals by descent from out-door species having eyes. I have already expressed myself in favor of such view, and deem that in order to prove it, we need only establish two or three propositions. First, that there are eyed genera corresponding closely in other general characters with the blind ones; second, that the condition of the visual organs is in some cave type variable; third, if the abortion of the visual organs can be shown to take place coincidentally with general growth to maturity, an important point is gained in explanation of the *modus operandi* of the process.

Fig. 115.

Erebomaster flavescens. Male organ from below.

First, as to corresponding forms; the *Typhlichthys* of the Mammoth is identical† with *Chologaster*, except in its lack of eyes.

* Our engraver has not correctly represented the posterior lateral border of the large dorsal scutum. The mandible should also have been represented as terminating in a pair of nippers. — EDS.

† Mr. Putnam shows that the known species of *Chologaster* differ from those of *Typhlichthys* in the lack of the papillary ridges, which is probably another generic character similar to the loss of eyes. The absence in *Chologaster* of minute palatine

Orconectes bears the same relation to *Cambarus; Stygobromus* bears nearly the same to *Gammarus*, and *Scoterpes* is *Spirostrephon* without eyes, and no pores.

Secondly, as to variability. I have already shown that in *Gronias nigrilabris*, the blind Silurid from the Conestoga in Pennsylvania, that while all of several specimens observed were blind, the degree of atrophy of the visual organs varies materially, not only in different fishes, but on different sides of the same fish. In some the corium is imperforate, in others perforate on one side, in others on both sides, a rudimental cornea being thus present. In some, the ball of the eye is oval and in others collapsed. This fish is related specifically to the *Amiurus nebulosus* of the same waters, more nearly than the latter is to certain other Amiuri of the Susquehanna river basin to which the Conestoga belongs, as for instance the *A. lynx;* it may be supposed to have been enclosed in a subterranean lake for a shorter time than the blind fishes of the Western Caves, not only on account of the less degree of loss of visual organs, but also in view of its very dark colors. A feature on which I partly relied in distinguishing the species, has perhaps a different meaning. The tentacles or beards were described as considerably shorter than those of allied species. On subsequently examining a number of individuals, I was struck with the irregularity in their lengths, and further inspection showed that the extremities were in each case enlarged, as though by a cicatrix. I have imagined that the abbreviation of the tentacles is then due to the attacks of carnivorous fishes which inhabit the subaërial waters into which the *Gronias* strays, from whom its blindness renders it unable to protect itself.

Thirdly, it is asserted that the young *Orconectes* possess eyes, and that perhaps those of the *Typhlichthys* do also. If these statements be accurate, we have here an example of what is known to occur elsewhere, for instance, in the whalebone whales. In a fœtal stage these animals possess rudimental teeth like other Cetacea, which are subsequently absorbed. This disappearance of the eyes is regarded with reason by Prof. Wyman as evidence of the descent of the blind forms from those with visual organs. I would suggest that the process of reduction illustrates the law of "retardation," accompanied by another phenomenon. Where characters

teeth, and the presence of an additional pair of pyloric cæca, which he mentions, will be apt to prove only specific.

which appear latest in embryonic history are lost, we have simple retardation, that is, the animal in successive generations fails to grow up to the highest point, falling farther and farther back, thus presenting an increasingly slower growth in this special respect. Where, as in the presence of eyes, we have a character early assumed in embryonic life, the retardation presents a somewhat different phase. Each successive generation, it is true, fails to come up to the completeness of its predecessor at maturity, and thus exhibits "retardation," but this process of reduction of rate of growth is followed by its termination in the part, long before growth has ceased in other organs. This is an exaggeration of retardation. Thus the eyes in the *Orconectes* probably once exhibited at maturity the incomplete characters now found in the young, for a long time a retarded growth continuing to adult age before its termination was gradually withdrawn to earlier stages. Growth ceasing entirely, the phase of atrophy succeeded, the organ become stationary at an early period of general growth, being removed, and its contents transferred to the use of other parts by the activity of "growth force." Thus for the loss of late assumed organs we have "retardation," but for that of early assumed ones, "retardation and atrophy."

In comparing the list of animals from the Wyandotte with that of the Mammoth Cave, it will be observed that the representatives in the former, of two of the blind genera of the latter, are furnished with eyes. These are the *Erebomaster* and *Spirostrephon*, which correspond with the *Acanthocheir* and *Scoterpes* respectively. In the outer part of a branch of the Wyandotte I took two eyed beetles the *Quedius spelæus* and a *Platynus*.

The out-door relatives of the blind forms are various. Those having congeners outside are the *Spirostrephon*, *Campodea*, *Machilis*, *Phora*, *Raphidophora*. Those with near but few allies, the *Scoterpes*, *Amblyopsis* and the three *Gonyleptidæ*. Species of the latter are much more rare in this country than those of *Phalangiidæ*, which are not known from the caves. The *Orconectes* is mostly fresh water in kindred, while Packard shows that those of the *Cæcidotea* are marine. Those of the *Cauloxenus* are partly marine, and those of the *Stygobromus* fresh water and marine.

The mutual relations of this cave life form an interesting subject. In the first place, two of the beetles, the crickets, the centipede, the small crustaceans (food of the blind fish) are more

or less herbivorous. They furnish food for the spiders, craw-fish, *Anophthalmus*, and the fish. The vegetable food supporting them is in the first place fungi, which in various small forms, grow in damp places in the cave, and they can always be found attached to excrementitious matter dropped by the bats, rats and other animals which extend their range to the outer air. Fungi also grow on the dead bodies of the animals which die in the caves, and are found abundantly on fragments of wood and boards brought in by human agency. The rats also have brought into fissures and cavities communicating with the cave, seeds, nuts and other vegetable matters, from time immemorial, which have furnished food for insects. Thus rats and bats have, no doubt, had much to do with the continuance of land life in the cave, and the mammals of the post-pliocene or earlier period, which first wandered and dwelt in its shades were introducers of a permanent land life.

As to the small crustaceans, little food is necessary to support their small economy, but even that little might be thought to be wanting, as we observe the clearness and limpidity of the water in which they dwell. Nevertheless the fact that some cave waters communicate with outside streams is a sufficient indication of the presence of vegetable life and vegetable débris in variable quantities at different times. Minute fresh water algæ no doubt occur there, the spores being brought in by external communication, while remains of larger forms, as confervæ, etc., would occur plentifully after floods. In the Wyandotte Cave no such connection is known to exist. Access by water is against the current of small streams which discharge from it. On this basis rests an animal life which is limited in extent and must be subject to many vicissitudes. Yet a fuller examination will probably add to the number of species and of these, no doubt, a greater or less number of parasites on those already known. The discovery of the little Lernæan shows that this strange form of life has resisted all the vicissitudes to which its host has been subjected. That it has outlived all the physiological struggles which a change of light and temperature must have produced, and that it still preys on the food of its host as its ancestors did, there is no doubt. The blindness of the fish has favored it in the "struggle for existence," and enabled it to maintain a position nearer the commissariat, with less danger to itself than did its forefathers.

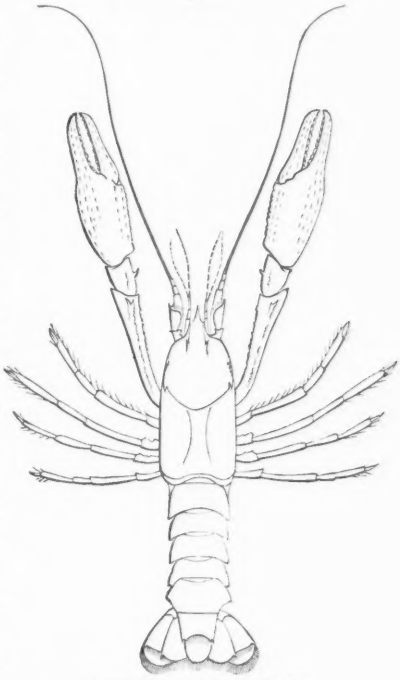
Descriptions of Species from the Wyandotte Cave.

ORCONECTES Cope.

Genus novum. Similar to *Cambarus*, but with the eyes rudimental with the cornea small and not facetted. The present genus embraces two species, the *O. inermis* of the Wyandotte and the *O. pellucidus* of the Mammoth Cave.

O. INERMIS Cope, sp. nov. This species is near the *O. pellucidus*, and differs as follows. Its proportions are generally less slender, and the spines less developed. The frontal process is considerably shorter, the terminal spine not extending beyond the apex of the antennal lamellæ and very little beyond the point of bifurcation of the first antennæ. In *O. pellucidus* the spine extends much beyond these points. The lateral points mark the middle of the length and support very rudimental spines; they are elongate in *O. pellucidus*. The basal lateral ridges are marked and convergent; basal spines short. The antennal lamellæ are much enlarged at the middle and contracted below, and are furnished with a fringe of long hairs. At the base of the second antennæ the margin of the thorax has a projecting convexity moderately developed. On the side of the thorax there is a small patch of weak prickles, and there are two on the anterior lateral suture of the abdomen. In *O. pellucidus* these spines are larger and much more numerous. The lateral outlines of the postabdominal segments are those of one extremity of an ellipse with a slight angulation at the extremity; in *O. pellucidus*, these are rectangular, with the hinder margin straight distally.

Fig. 116.



Orconectes inermis Cope, nat. size.

The cheles are slender, but less so than in *O. pellucidus*, the opposed processes are flat and not ridged along the middle as in that species, and the general surface is smooth or nearly so, without the tubercular roughness of *O. pellucidus*. The cheles of the second and third legs partake of the broader form of the first. The third femora of the third and fourth legs with short hooks. The spines of the basal segments of the first legs are much as in the old species. The shell of the specimen taken early in September was very soft on the abdominal segment, but well calcified elsewhere. Color white. Total length, head and body, m.054 (= 2⅛ in.). Length of spine from thorax margin, .0055. Length cheliform segment of first legs, .024; width do., .0075; length movable (last) segment of do., .0123.

The single specimen of this species has been compared with four of the *O. pellucidus* in the Museum of the Academy Natural Sciences, one of which is young; the characters above alluded to are constant. They are also exhibited by Dr. Hagen's figure,* except the slenderness of the cheles, which is less than in our specimens. This figure is copied by Dr. Packard.

CÆCIDOTEA Packard.

C. MICROCEPHALA Cope, sp. nov. "Unknown crustacean with external egg-pouches." Cope. Ann. Magaz. Nat. Hist., 1871, November.

*Catalogue of the Museum Comparative Zoology. Monograph of the *Astacidæ* of North America.

Abdominal segments confluent into a single one; thoracic segments seven, well distinguished. Inner antennæ close together, situated between the larger outer ones; both issuing from below the margin of the dorsal plate of the cephalic segment. The specimens are in bad condition, having lost their limbs, egg-pouches and the distal portions of their antennæ. The head is small, narrower and scarcely longer than the first thoracic segment. The segments are all smooth and without hairs or sculpture. The abdominal segment is quadrate-oval, truncate posteriorly, without projection or mucro, above regularly, but slightly convex. Egg-pouches well separated, oval in form, moderate in size. The limbs are given off from the free extremities of the segments. Branchial laminæ extending to the extremity of the abdominal segment, in contact throughout on the median line. Color pure white. Length with egg-pouches, but with only four basal joints of antennæ, 5-16th of an inch (m.0077).

This species is near the *Cæcidotea stygia* of Dr. Packard (American Naturalist, 1871, pp. 751–2) and, as such, of much interest. It has a much smaller and more acuminate head than the *Cæcidotea stygia* Pack., though in general the species are not very different in other respects, and are of about the same size. In the *C. microcephala* the abdomen is truncate, in the longer known species, angulate.

This species may then be regarded as the representative of the *C. stygia* in the Wyandotte Cave.

CAULOXENUS Cope.

Fam. *Lernæopodidæ* Gerst. The adult female stout, sack-like, not articulated. Cephalothorax not elongate, large, separated from the abdomen by a strong constriction. Anchor or jaw-feet elongate, arm-like, closely united throughout their length, originating at or behind the middle of the cephalothorax. Cephalothorax undivided, abdomen rounded, sack-shaped, not segmented. Egg-pouches short, wide.

This genus differs from its allies, *Achtheres* and *Lernæopoda* in the fusion of the jaw-limbs, between which a faint dividing depression only may be distinguished, when they are viewed from below. The form of the abdomen is much as in *Achtheres*, but segmentation is not distinguishable. The short, wide egg-sacks are as in other genera of this family; they are well separated and are filled with large, globular eggs.

The structure of the mouth organs is not readily determinable in my single specimen, owing to the intervention of the very stout jaw-feet. They are only visible in profile (see fig. 112). A pair of perhaps first antennal segments projects from the head, is curved upwards and is without terminal bristle or hook; a short process at the base may represent a tactile appendage. The inferior antennæ are well marked and equally without appendage. There are some bodies between them, perhaps on the middle line, whose nature is not determinable. There is no trace of eyes. The chitinous stem of the common jaw-feet is rather long, and expands discoidally at the extremity.

C. STYGIUS Cope. Proceed. Acad. Nat. Sci., Phila., 1871, p. 297. Cephalothorax nearly as long as abdomen, oval, subcompressed; abdomen subround, subdepressed, separated by a rather long constriction. Egg-sacks rounded, shorter than abdomen, on very short pedicels. Jaw-limbs nearly as wide as the abdomen, and not quite so long, much constricted distally at the point of origin of the anchoring stem, which is nearly as long as the arm proper. No dermal appendages of any kind. Rostral region projecting above the arms, subconical. Color uniform whitish. Length (without anchor-claws) m.003.

EREBOMASTER Cope.

Genus novum, familiæ *Gonyleptidarum*. Cephalothoracic shield extending over a considerable part of the abdomen, which has seven segments. Tarsus with three joints and a terminal claw. Palpi with five joints and a claw, the fourth and fifth with a series of strong spines on each side. Mandibles chelate. Cephalothorax with a median conical eminence, which has an ocellus on each side of its base. Posterior trochanters like the others.

This genus is related to the *Acanthocheir* of Lucas, which has been recently figured in the NATURALIST. According to Wood that genus is cyclesis. Dr. Packard's figure presents many peculiarities. Thus the abdomen is not represented as segmented, and there is no distinct cephalothoracic shield; the tarsi are represented as only two-jointed. From this and other facts, I suspect that *Acanthocheir* should be placed near *Erebomaster* among the *Gonyleptidæ*.

E. FLAVESCENS Cope, sp. nov. "Opilio-like Spider," Cope. Ann. Magaz. Nat. Hist., November, 1871. Body smooth, limbs very minutely hairy. Two spines at the extremity of the penultimate tibia. Three or four spines at the base of the third segment of the palpi, not longer than those of the third, which has four on the outer side. Spines of last joint longest. The longest limbs are about twice as long as the total length of the body. Maxillæ rather long. Color a light brownish yellow. Length of head and body m.0025.

In one specimen the male organ is protruded and extends to the mandibular cheles; it is not chitinized and appears to be twice segmented. It terminates in a short point with mucro, which is flanked on either side by a point with two divergent bristles.

ANOPHTHALMUS Sturm.

A. TENUIS Horn. Pale rufo-testaceous, shining. Head slightly darker in color, oval and arcuately biimpressed. Thorax broader than the head, slightly longer than broad,

and sinuately narrowing to hind angles, which are exactly rectangular; median line distinctly impressed in its entire length, basal impression deep; base of thorax truncate. Elytra elongate oval, feebly convex, at base slightly flattened; two-thirds longer than broad, humeri obtusely rounded; surface with feeble traces of striæ and three dorsal setigerous punctures on each elytron, in or nearest to the position of the third stria. Body beneath similar in color to the upper surface, legs somewhat paler. Length .18–.24 inch; 4.5–6 mm.

Three specimens of this species were collected. This species is closely allied to *A. Menetriesi* Motsch. (*angulatus* LeC.), but differs by its more elongate and less robust form and less convex surface. The elytra are smoother and with very feeble traces of striæ. The two species differ especially in the form of the hinder thoracic angles and base of thorax. In *Menetriesi*, the angles are acute, slightly prominent externally and the base of the thorax slightly prolonged, while in the present species the angles are strictly rectangular and the base truncate. This species must be placed near the one just cited in my table of our species (Trans. Ent. Soc., Phil., 1868, p. 126).

The new species above described is the most slender in form of any in our cabinets.

A. EREMITA Horn. — Pale, rufo-testaceous, feebly shining. Head oval, arcuately biimpressed, impressions moderately deep, intervening space feebly convex. Thorax wider at widest portion than long, sides moderately rounded in front, gradually narrowed to base, hind angles rectangular, base truncate and as wide as length of thorax; disc feebly convex, median line distinctly impressed, basal transverse impression moderate. Elytra oval, less shining than thorax and sparsely clothed with very short, erect pubescence; striæ obsolete; three dorsal punctures on the line of the third stria. Length .20 inch; 5 mm.

One specimen of this species was collected with preceding in Wyandotte Cave. The only species with which it might be confounded is that previously described by me under the name *A. pusio*, and although differing very notably on comparison in their general aspect, the points of difference are not easily made plain in a description. The present species is in all respects broader and less depressed, without being convex as in *Menetriesi*: the thorax is broader, less narrowed behind, and the sides more rounded. The elytra are less shining and the pubescence more distinct, although in both species the pubescence can only be observed by holding the specimen between the eye and the light and then only with a good power. In the three species at the head of my analytical table, no signs whatever of pubescence can be observed. The elytral striæ are here also obliterated, faint traces are discernible only at the base. The basal margin is not prolonged.

QUEDIUS Leach.

Q. SPELÆUS Horn. — Pale, rufo-testaceous, shining. Head broadly oval, smooth, shining, slightly impressed between the eyes in front; two punctures bearing short setæ in front of the eyes, another at the side of vertex, two at the side of head behind, hind angle of head slightly pubescent. Eyes not large, nearly round and prominent. Antennæ moderately stout, one-half longer than the head, first joint nearly as long as the second and third together, the third one-half longer than the second; joints 4–10, gradually but feebly stouter, cylindrical and scarcely longer than wide, joint 11, longer than preceding and subacute at tip. Thorax slightly broader than ate elytra, sides distinctly explanate, broader than long, emarginate in front, anterior hngles subacute, sides and base broadly rounded, forming nearly a circle, less the emargination in front; surface smooth, shining and with punctures arranged as follows: a dorsal series of two punctures moderately distant from the anterior margin, a lateral oblique series of three or four punctures, one puncture being within the line of the lateral but not belonging to the dorsal series; a marginal row of moderately large punctures close to the lateral margin extending along the base, the punctures being more distant in the latter region. Prosternal process behind the coxæ corneous. Scutellum smooth, shining. Elytra slightly longer than the thorax, rather densely and moderately coarsely punctured and sparsely clothed with yellowish pubescence. Abdomen moderately elongate, longer than the head, thorax and elytra together, slightly narrowed to apex, moderately punctured but less densely than the elytra, above and beneath sparsely clothed with brownish hairs. Body beneath and legs similar in color to the upper surface. Length .45–.50 inch; 11.5–12.5 mm. Abundantly distinct from all our species by the color and thoracic punctures. The sides of thorax are more explanate than any of our species except *Q. explanatus* LeC.

Two specimens were collected a short distance within the mouth of Wyandotte Cave.

Descriptions of species from the Mammoth Cave.

PHRIXIS Cope.

Genus novum *Gonyleptidarum*. Cephalothoracic shield covering dorsum of abdomen, which is posteriorly segmented. Eyes none. Tarsi multiarticulate, clawed. Palpi spiniferous, maxillæ chelate.

This genus is near *Erebomaster*, differing in the multiarticulate tarsi, and absence of eyes. It is nearer to *Acanthocheir*, being like it eyeless, but the latter according to Dr.

Packard's figure (in AMERICAN NATURALIST, l. c.) has tarsi as in the first named genus, one or two jointed. In *Phrixis* they are much as in *Phalangium*, which the species also resembles in its long limbs.

PHRIXIS LONGIPES Cope, sp. nov. Legs eight times as long as the body, tarsus of the shorter with five, those of the longer with six joints, those of the longest not counted. The first and second segments are very long; tibiæ shorter than femora; coxæ subglobular. Legs with scattered, rather short hairs. Last tarsal joint with one claw and an opposing bristle, in two limbs as long as femora, exceeding total of body, with two claws. Palpi five jointed, the third, fourth and fifth with large spines on each side, the second, or vertical, with four near the base directed forwards and two near the upper end directed inwards. Mandibles pubescent. Five narrow, and one terminal, segments of the abdomen, the penultimate wider than the others. Body pubescent. Color very pale, with a straw-colored shade. Length of body 1.17 lines, or m.00225; longest leg m.02.

This species, though small, considerably exceeds the *Acanthocheir armatus* in dimensions.

STYGOBROMUS Cope.

Gen. nov. *Gammaribarum*. Near *Gammarus*. The first antennæ with flagellum, and much shorter than the second. Two pairs of limbs chelate by the inflexion of the last claw-like segment; other limbs clawed. Terminal abdominal segment very short, spiniferous; the penultimate segment with a stout limb with two equal styles, the antepenultimate short, two-jointed and undivided. Eyes none.

This genus is nearer to the true *Gammarus* than the allied genus described from the Austrian Caves, the *Niphargus* of Schiödte.* In the latter the first antennæ are the larger, and the body terminates in a very long style; the last abdominal limb is undivided like that which precedes it. In *Stygobromus* the penultimate limb is like that represented by Schiödte for *Niphargus*, though I am not certain whether it is homologically identical. The last limb is about equally divided, but the simple basis is long and stout.

It is just possible that the antepenultimate limb represents the basis and one style only, for in that of one side a slight process appears at the extremity of the basal segment, though it is not visible on that of the other. The terminal limbs are recurved and appressed to the last abdominal segment, forming a fulcrum or prop. The animals of this genus are aquatic, and swim much as the common *Gammari*. The absence of eyes is another example of the adaptation to darkness.

STYGOBROMUS VITREUS Cope. "Gammaroid Crustacean" Cope, Ann. Mag. Nat. Hist., Nov., 1871. Two last pairs of limbs appressed to last abdominal bristles and of nearly equal length, forming a brush. Last segment of abdomen with two terminal bristles. Last segment of the limbs from the third to the seventh, with a long, straight claw directed forwards. Fringed limbs behind this point very small. Outer or second antennæ half as long as the first, which embrace eleven segments, and are about as long as the last five abdominal segments. Total length of head and body 2.1 lines or .0045 m.

There are few conspicuous hairs, the most so are those which stand at the extremity of the last joint of the limbs, rising from the base of the claw. Color translucent.

REVIEWS AND BOOK NOTICES.

VEGETABLE PARASITES AS CAUSES OF DISEASE.†—The first of these two papers gives the recent ideas, as seen by an able and advanced observer, in regard to those forms of cryptogamic vegetation whose growth is believed to be the cause of Ringworm, Favus, and a few similar affections. Dr. White discusses the

* Proc. Entom. Soc., London, 1851, p. 150.

† Vegetable Parasites, and the diseases caused by their growth upon man. By James C. White, M.D., Prof. of Dermatology in Harvard University. 8vo pamphlet. Boston. 1872.

On the development of Vegetable Organisms within the Thorax of Living Birds. By Dr. James Murie, F.L.S., etc.; Lecturer on Comp. Anat., Middlesex Hospital. Read before the Royal Microscopical Society, Jan. 3, 1872.

nature and history of these cryptogamia, their relations to each other and to common moulds, and their importance as sources of contagion; while, with much good sense and rare judgment, the question of treatment is quietly left to the professional books.

Dr. White's general introductory view of the microscopic fungi is clear and significant, and forms a convenient ground for the comparison of views even by those whose ideas are inconsistent with it. The nutritive system, or *mycelium*, consists of slender cells or tubes, branched, intertwined, and furnished with occasional transverse partitions. This may increase directly by subdivision into cells with similar powers of branching and of self-multiplication, or by the production at the ends of some of the branches of minute spherical or ovoid cells inclosed in capsules called sporangia, or growing in bushes or bead-like chains, when they are called *conidia* or *spores*. These conidia may be found detached, either single or in rows or compound cells, and are capable of reproducing the mycelium. Under certain conditions the substance, called plasma, of these various forms may become cloudy and divided into infinitely small free cells which multiply by self-division and may exhibit peculiar movements. These cells or points, if more or less spherical, are called *micrococcus*; if somewhat elongated and swollen at one end, bacteria; and if joined in minute chains, vibriones. They have been much and loosely discussed, and are supposed to be the primitive forms of organic life. In suitable fluids they develop into larger cells, single or united and sometimes elongating like mycelium, known as ferment cells. This is the submerged form of fungus life, familiarly observed in the yeast plant and other ferments; and is capable of reversion to micrococcus, or under favorable circumstances may attain to mycelial and conidial development. It closely resembles the spores of ringworm, etc.

These forms make up the structure of the moulds, and their varying size, shape, and predominance have been regarded as specific characters; but recent observations show that such variations may be due to the nature of the soil and atmospheric conditions, and that the recently recognized species are often varieties of well known individuals, prevented from their usual development by circumstances of position. This tendency to variation has been termed pleomorphism.

These low forms of vegetation occasion the processes of fermen-

tation by which important chemical products are obtained; and they change dead matter (so called) into the state best fitted for the support of future generations. They may also live at the expense of the living tissues of plants and animals, although possibly only upon those which are depressed by some cause below a full vital energy. The muscadine of the silk worm and the oidium of the Madeira vineyards are cited as examples of the importance of such destructive agency.

The effects of such fungi upon the surface of men are never fatal, or constitutionally hurtful, but they are greatly annoying and may last for many years. Schœnlein in 1839 first recognized the cryptogamic character of the crusts of Favus; and after much dispute, the following affections are now safely referred to similar causes—Ringworm (in which the author includes as varieties *Eczema marginatum*, *Tinea tonsurans*, *Sycosis*, and *Ringworm of the Nail*) and *Pityriasis versicolor*. Still a subject of dispute is *Alopecia areata*, and *Myringomycosis*, both of which are often accompanied if not caused by cryptogamic growths. On the other hand the *chignon-fungus* and some other controverted cases are safely considered pseudo-parasites.

Several of these parasitic plants are common upon the domestic animals, and in some instances may possibly have been originally derived from them.

On the question of the identity of the several vegetable parasites, and their relations to the common moulds, much study has been expended, and with remarkably contradictory results. Equally safe observers reach the extreme opposite conclusions. The methods of investigation are clinical observation, artificial inoculation, and development of the fungi by cultivation. Clinically favus is distinct, and the others are separable with reasonable certainty: inoculation leads to the same conclusion, notwithstanding the deceptive inferences which may easily be drawn from accidental coincidences: and cultivation, while it usually furnishes an abundance of penicillium, aspergillus and other familiar moulds, is so liable to error from their accidental introduction that it has as yet, in the author's judgment, furnished no sufficient data for admitting the identity of the subjects of the paper with any of the common moulds.

The vegetable parasites are an occasional cause of alterations of the epidermis and its appendages, causing baldness, etc. They

are communicated by actual contact rather than by the aërial transmission of spores; and are therefore usually avoidable by ordinary care. With the exception of the varieties of ringworm, they are comparatively rare. Some, but not all of them, are particularly liable to attack debilitated constitutions. Schools, and especially orphan asylums, and barbers' shops have heretofore furnished most frequently the conditions essential to the spread of these forms of vegetation.

A more curious branch of this subject is the occurrence of vegetable organisms within the closed cavities of living animals. That organisms usually presumed to be dependent upon some parentage for their existence should grow within cavities communicating with the external air, as the stomach for instance, is really a case of external parasitism; as the germs might be easily introduced by the air or otherwise. Of far different importance is the occurrence of such growths within tissues or cavities having no external openings. The presence of parasitic animals in the eye, brain, etc., and of mould within the thorax and other closed cavities of living animals, has seemed to many to have an important bearing upon the question of spontaneous generation. At the present time, however, when the possibility of the passage of solid particles through uninjured living tissues is believed by many if not by most microscopists, the entrance of the germs is no longer incredible.

Dr. Murie reports three new cases of vegetable-like mould found within the thorax of birds. Two of the three birds were known to be ill for a short time before death. No cause of death, unless the fungus be considered such, was known. The cryptogamic growth was in all the cases a greenish white patch upon a thickened and injected portion of the pleural membranes. In one case the lungs exhibited spots of lobular pneumonia. Under a microscope the vegetation revealed linear, interlaced filaments and innumerable echinate circular cells, and under higher powers, oval or elliptical cells distinctly nucleated. Mr. Cooke hinted the possibility that these growths were algæ: but Dr. Murie is convinced that they are a species of *Aspergillus*, of the order Mucedines, the microscopical elements above mentioned being the mycelium and spores of the fungus. Although such appearances have been sometimes considered as of post-mortem production, he believes that the spores were introduced by the breath into the

lungs, penetrated the moist and delicate tissues, and by development occasioned the death of the birds; some antecedent state of the system being admitted as rendering possible the development of the fungus.

Including these new cases, eighteen kinds of birds are recorded as liable to attacks of fungi, either accompanying or causing fatal disease. As they belong to many different groups of birds it may be inferred that the whole class is predisposed to them under special but yet unknown conditions; these moulds, as far as at present definitely determined, belong to two or three species of *Aspergillus*, and derive great importance from the interest at present attached to the investigation and control of cryptogamic causes of disease. —R. H. W.

BOTANY.

Exuberance of Pollen.— For many years I have observed with wonder, in the early summer, or about the month of June, the immense amount of pollen scattered in the vicinities where coniferous trees and shrubs are abundant. On the Great Lakes I have often noticed the surface of the water covered for miles with a thick coating of this yellowish deposit, looking as if it was strewn with sulphur, which in calm weather continued for days together. At times, indeed, it is so difficult to get the water free from the pollen that it is rather unpleasant for drinking, cooking, or washing purposes.

In walking through grounds where the Juniper (*Juniperus communis* Linn.) covered the sterile soil, I have frequently noticed the clouds of golden dust which I raised, and that my boots were yellow from the pollen. What remarkable prodigality this displays on Nature's part. It is difficult to conceive a use for the pollen thus spread over the land and the lake waters; though there may be one hidden from us.

This superabundance of the male principle, which seems to be the rule throughout Nature, is a peculiarly interesting and suggestive fact, and worthy of more investigation and thought than it has heretofore received.

In plants, insects carry off a considerable quantity of the pollen: bees, for example, to make bee-bread; and we may know a few more instances of its use besides its legitimate one of fertilization. But all of these taken together would scarcely make

more than a small fraction of the amount of this life-dust covering with its thick sulphur-colored coat a single square mile of the surface of Lake Huron or Lake Superior.—Henry Gillman, *Detroit, Michigan.*

Double Flowers of Ranunculus rhomboideus.—Specimens of this are sometimes found in Floyd County, Iowa, with perfectly double flowers. I have found several plants, and one of these I transferred to a bed in the flower-garden, where it thrived finely and increased to a clump six inches in diameter, which the next spring was perfectly enveloped with the little bright yellow flowers. No seeds were produced; and during the two or three seasons in which the plant was cared for there was no sign of change to single flowers. The plant was quite attractive; and as it blooms very early and profusely, it would seem to have some of the qualities required to entitle it to a place among cultivated flowers.—J. C. Arthur, *Iowa Agr. College.*

[To be sure; being a dwarf species, it would be desirable, and Prof. A. might make a little money, while doing a good thing, by propagating the plant, and introducing it through the florists. In acknowledgment of the hint, send us, please, a good root of it.—Eds.]

Quercus alba, var. Gunnissonii.—In Watson's report, Hall and Harbor's Rocky Mountain *Quercus Douglassii* var. *Neo-Mexicana*, is said to be *Q. alba*, var. *Gunnissonii*. My specimens are as much like Hall and Harbor's as if they had been taken from the same plants. I can therefore speak of the living trees as I saw them, and, without regard to their identity with *Q. Gunnissonii*, would suggest a doubt as to the propriety of their reference to *Q. alba*.

I have had experience with trees in a living state of both European and American species, and the idea left on my mind after journeying several days through tracts on which this oak in question grew, was that it partook more of the character of *Quercus robur* than of *Q. alba*. Among the European species I have noticed a remarkable tendency in some plants of *Quercus cerris* to approach *Q. robur;* and among these Rocky Mountain forms were many which had the leaves and general appearance of the branches much like *Quercus cerris*. This was especially the case with some low growing plants (about three feet high), about a

day's journey north of Pike's Peak. South of Pike's Peak were some nearly fifteen feet high. None had the bark of *Q. alba*, but in other respects favored *Q. robur* rather than *Q. alba*.

I know how easy it is to be mistaken. Though I do not think Mr. Watson is right, I am by no means certain of my own view. I write merely to suggest that full reliance be not placed on this supposed relationship without a fuller examination. A few years ago it would be deemed a matter of very little consequence; but as the question of evolution has risen to such magnitude, such facts as these are worthy of the most careful scrutiny. As a general rule it struck me that, accepting the theory of evolution as true, the plants of the Rocky Mountain region of Colorado favored a derivation from European rather than Eastern American forms, and that this oak was one of the instances. — THOMAS MEEHAN.

THE FORMATION OF OZONE BY FLOWERS. — It has been found by Mantegazza (*Rendiconti del Reale Istituto Lombardo*, vol. iii. fasc. vi., abstracted in *Der Naturforscher*, 27th April) that many essential oils, like that of peppermint, turpentine, oil of cloves, lavender, bergamot, aniseseed, nutmeg, thyme, and others, when in contact with the oxygen of the atmosphere in presence of sunlight, develop very large quantities of ozone. The oxidation of these oils is, in fact, a very convenient source of ozone, as they, even in small quantities, ozonize much oxygen. The action is strongest in direct sunlight, far less so in suffused daylight, and very weak or at an end in the dark. The development of ozone which has been begun in the light continues for a long time in darkness. In the same manner act eau-de-cologne, hydromel, and other aromatic tinctures on exposure to the solar rays. Experiments which Mantegazza has made on flowers with powerful perfume, such as the narcissus, hyacinth, heliotrope, mignonette, and others, in closed vessels, proved that they also form ozone. Those with fainter perfume produced less ozone, those without scent none at all. Mantegazza believes that this important source of ozone is of hygienic value for the purification of the air of marshy districts. — *Academy*.

JUNIPERUS OCCIDENTALIS. — Mr. Watson remarks that this species has not yet been found in Colorado. It grows on the low hills to the eastward of Pike's Peak; not abundantly, but together

with larger quantities of *Juniperus Virginiana*. It here makes but a low stubby tree of from fifteen to twenty feet high; but with very stout trunk in proportion to its low stature. — THOMAS MEEHAN.

WILD DOUBLE-FLOWERED EPIGÆA REPENS is received from Worcester by Mr. Arba Pierce, who has gathered similar flowers from the same plant for several years. The doubling comes from the partial conversion of the stamens into petals, the outer and most transformed series more or less coalescent into a tube.— A. GRAY.

EXPERIMENTS ON HYBRIDIZATION. — Mr. J. Anderson-Henry, one of our most skilful horticulturists, is contributing to "The Garden" the details of some important experiments on pure hybridization, or crossing distinct species of plants. He finds that in those plants which possess two series of stamens, one long and one short, the results vary essentially according as the pollen is used from one or the other series to effect the fertilization. He uses the short stamens only in all cases where he wishes to cross a large on a small species, and with the most successful results. The converse also he finds to hold good, remarkable hybrids being produced by using the long stamens where he wished to cross a small on a large species. The reason of this he considers to be that the shorter stamens contain pollen of smaller grains, and therefore better fitted to emit its tubes through the style to fertilize the ovules of the smaller species, and *vice versâ*. The plants chiefly operated upon by Mr. Anderson-Henry are various species of Geranium, Rhododendron, and Azalea. — *Academy*.

CALYPSO.

(A rare Orchid of the North.)

BY W. W. BAILEY.

Calypso, goddess of an ancient time,
(I learn it not from any Grecian rhyme,
And yet the story I can vouch is true)
Beneath a pine-tree lost her dainty shoe.

No workmanship of mortal can compare
With what's exhibited in beauty there,
And looking at the treasure 'neath the tree,
The goddess' self I almost hope to see.

The tints of purple and the texture fine,
The curves of beauty shown in every line,
With fringes exquisite of golden hue,
Perfect the wonders of the fairy shoe.

The goddess surely must have been in haste.
Like Daphne fleeing when Apollo chased,
And leaving here her slipper by the way,
Intends to find it on another day.

And will she come to seek it here or no?
The day is lengthening but I cannot go,
Until I see her bring the absent mate
Of this rare beauty, though the time is late.

I watch, but still no classic form I see,
Naught but the slipper 'neath the forest tree:
And so, for fear of some purloining elf,
The precious relic I secure myself.

ZOOLOGY.

New Birds in Southern Illinois.— In the summer of 1871 the following species were noticed, and two of them obtained, by the writer, in Richland and Wabash Counties, in the south-eastern portion of Illinois, about latitude 38°, 25′: — *Vireo Bellii*, *Peucæa æstivalis*, *Cyanospiza ciris*, *Asturina plagiata* and *Falco Mexicanus*. The *Vireo Bellii* was found to be a common, or at least not rare, species in the thickets on the prairies. It was first seen on the 8th of June, when specimens were shot, and being then in full song, there can be little doubt that the species breeds there. The *Peucæa æstivalis*— a bird heretofore found only in South Carolina, Georgia, Florida, etc. — was found to be a common species in Wabash County, in old fields bordering on road-sides. As specimens of both old and young were obtained (on the 11th and 14th of August), and the former being in full song throughout the summer, there can be no doubt that the species breeds there. *Cyanospiza ciris* was seen only once — on the 10th of June — when it was observed in Wabash County, in an open thicket in the corner of an old weedy field. As the locality was not visited again, it is possible that the species may have been nesting there. *Asturina plagiata* was seen, and twice shot at, on the 19th of August, 1871, on Fox prairie, in Richland Co. I came across it while hunting Swallow-tailed and Mississippi kites (*Nauclerus forficatus* and *Ictinia Mississippiensis*), and while being annoyed by several of the latter, was well seen — it being immediately overhead — and shot at; it was afterwards followed a long distance among the trees which grew in a ravine intersecting the prairie, but finally lost. There can not be the slightest doubt as to the proper identification of the species, which I have been well acquainted with for years, and one which

could not be mistaken upon such close observation of it as that allowed for the individual in question. *Falco Mexicanus* (=*polyagrus* Cassin) was seen near Mt. Carmel, on the 27th of September, and near Bridgeport in July, 1871. This species has been observed, and also obtained, once before in Illinois, but in the northwestern portion, at Rock Island, by Mr. J. D. Sargent. The others are all new to the fauna of the state.— ROBERT RIDGWAY.

THE ANÆSTHETIC SCHOOL.— Prof. Cope remarked at the meeting of the Philadelphia Academy on May 21, that there were, and had been for years, two schools of naturalists, whose modes of treating Natural History subjects were quite different. In reference to these modes they might be called the *technical* and *natural* schools. As, however, the claim of the latter to better appreciation of natural affinities and classification, appeared to him to be doubtful, he thought they had better be called the *pseudo-natural* school, while the so-called technical naturalists were such, on account of their pursuing an analytic method. The pseudo-natural school decided on the affinities of organic types by their "physiognomy" or their *facies*, *habit* and "toute ensemble," reading nature with an artist's eye, and attaining opinions of systems, without the trouble of much anatomical study. They protested against the strict adhesion to "technical" (or structural) characters, saying that they violate "natural affinities" oftener than they support or express them. Thus their systems become physiognomical, and please the eye by their appearance, rather than the mind by their expression of exact structural relations. In accordance with this system, species were always well distinguished and could not have been derived from common parents, but that nevertheless everything "runs together," and that the higher groupings are mainly "opinionative." In fact, that although nature has a beautiful system we do not yet understand it, and that it is "too soon to generalize." Perhaps this obscurity has its advantages, as it certainly shelters in its profundities any theory of creation its supporters may choose to adopt. Hence they might be called the *Anæsthetic* school, or *anæsthesiasts* (or ἀναισθησις). The *unnatural* school think that the way of determining the origin and relations of an object is to ascertain of what it is composed. This was to be accomplished by analysis of all its appearances and an account taken of every character. In this way the

structure is learned and a system based on anatomy is established. As anatomical systems are unnatural, and anatomical characters very difficult to discover by the anæsthesiasts, they regard such systems with disfavor, although they may constitute the only correct classification of bones, teeth, brains, etc. The analysts even find that species having very close specific relationships occasionally present different generic characters. This was proof positive to the anæsthesiast of the errors of the technical school. But it was still less to their credit that they laid stress on variations and monstrosities, which were mere accidents. The fact that the analyzers believed in the development of species, showed their systems to be unnatural. The speaker did not take sides, but observed that in order to learn the relations of a species, he usually examined it first.

MICROLEPIDOPTERA. — I have read with much interest Lord Walsingham's paper in the May number of the NATURALIST; and as I have given a good deal of attention to the *Tineina* and have received several letters recently as to collecting them, I wish to add a short note to Lord Walsingham's paper.

When one is at home or at a stationary camp, infinitely the best plan is to rear them from the larvæ and this is especially true of the leaf mining species. With such species as leave the mine to pupate, it is best to have a little moistened sand at the bottom of the wide mouthed bottle used as a breeding cage.

I have never found that the muscles were rendered rigid by the use of chloroform for killing the insect, as suggested by Lord Walsingham, but I have found that the positions of the wings and palpi are so variable when the insect is killed by chloroform that they can not be safely used as generic characters.

As the slighest denudation frequently renders the identification of minute species impossible, and it is exceedingly difficult to set them without some slight denudation, I do not attempt to set the smaller species (*Lithocolletidæ*, *Nepticula*, etc.). For such species I use the ordinary "deep cell" of a microscopic slide (small and shallow pill boxes will answer as well) laying a small piece of cotton or cotton wool on the bottom and covering the pill box with its top, or the cell with the ordinary glass cover held down by a small gum-elastic band. For observation under the lens I hold them in a small forceps by the legs.

For long collecting trips extensive preparations such as are described by Lord Walsingham are necessary. But for a morning's work about home it will be found convenient to take a wide-mouthed one ounce vial, a vial of chloroform, and a small paper box, say two inches square by one-half of an inch deep, with a piece of cottonbatting fitting into the bottom and another into the top of it. Loosen the stopper of the wide-mouthed vial, and put one or two drops of chloroform on it so that the fumes will fill the vial and then tighten the stopper again. When you find the microlepidopteron resting upon a fence, or the trunk or leaf of a tree, remove the stopper and invert the vial over the insect; it will spring back into the vial and in a moment will be quiescent; it may then be removed to the paper box (between the two pieces of batting, which will hold it steady and prevent it from getting rubbed). A drop or two of chloroform in the box will complete the work. The box may be carried safely in the vest pocket and the insects set upon return home.

Lord Walsingham says nothing about collecting from fences, etc., and recommends the late hours of the day as best for net-collecting. But for collecting with the vial as above described I have found the later morning hours, say from ten to one o'clock, the best and the trunks and fences the best localities. Out of at least one hundred and fifty species of *Tineina* which I have found here, fully three-fourths have been taken resting upon the leeward side of a board fence not two hundred yards long, at Linden Grove Cemetery at this place.—V. T. Chambers, *Covington, Ky.*

On the Occurrence of a Near Relative of Ægiothus flavirostris, at Waltham, Massachusetts.—Mr. Wm. Brewster, of Cambridge, Mass., some time since transmitted to the Smithsonian Institution, a specimen of a species of Ægiothus which heretofore has not been noticed as occurring on this continent. It was obtained Nov. 1st, 1870, from a flock of the common *Æ. linarius*, of which six specimens were also killed at the same shot. The specimen in question agrees most closely with females of *Æ. flavirostris*, a European species; but differs in some very essential respects, the most important of which is a tinge of sulphur-yellow in some places instead of tawny buff, which reminds one, at first sight, of the *Chrysomitris pinus;* the tail is also shorter than in *Æ. flavirostris* proper. From the two common North American

species (*Æ. linarius*, = *fuscescens*, *rostratus* and *Holböllii*; and *Æ. exilipes*, = *Æ. canescens*, of which this is the smaller southern race) it differs in lacking the red pileum, and in the total absence of the dusky gular spot; besides in many other minor respects. The adult male of true *Æ. flavirostris* has the rump rosy, but has no crimson on the crown; and has the primaries and rectrices conspicuously edged with white. In view of the total differences from *Æ. linarius* and *exilipes* — in all the numerous stages of plumage — and taking into account its close resemblance to the female of *Æ. flavirostris*, it seems reasonable to place this specimen near that species; while at the same time, the features in which it does not correspond with the latter are sufficiently important to warrant our characterizing it as a different race which, perhaps, represents the true *flavirostris* on our Continent; we accordingly name it *Ægiothus* (*flavirostris* var.) *Brewsterii*; under which name it is noticed in Professor Baird's new work on North American Birds, now in press.— Robert Ridgway.

A Spike-horn Muledeer.— Prof. Cope, at a meeting of the Academy of Natural Sciences, May 21, called attention to the anterior curvature of the axis of the horn in the common deer, *Cariacus Virginianus*, and said it was a point of interest to determine whether the true axis or beam, was curved forwards or not. On comparison with the *Cariacus macrotis* of the Plains, it was found that the true beam was partly erect and was branched (as already shown by Baird), while an anterior snag was directed forwards, marking exactly the curved line of the axis of the *C. Virginianus*. The curvature of the latter was then shown to be due to the predominant development of this large anterior snag, and the partial suppression of the true beam. He then exhibited a spike, or second year's horn of the *C. Virginianus*, and alluded to the occasional occurrence of permanent spike-horned deer in the Adirondack region of New York. He said Alexander B. Lamberton, a gentleman who had spent much time in that region, confirmed the statements that had been made as to their existence, but said that they were rare. He then exhibited a pair of simple beams, or spikes, of two feet and a half in length, which had been taken from a black-tailed deer (*C. macrotis*), shot within three miles of the Kansas Pacific Railroad, in Kansas. They had evidently belonged to an adult animal, and were the first examples

of spike-horned deer of that species which had been recorded. It was obtained by Dr. J. H. Janeway.

Economical Entomology.— The plant lice affecting the vines to such a fearful extent in France, and which in this country have already done considerable damage, is still attracting much attention. The French Academy, as we learn from the "Revue Scientifique," has offered a prize of twenty thousand francs to encourage studies to ascertain a remedy which shall protect the vine without destroying it. The best remedy against the *Phylloxera*, as it is called, is the use of phenic acid, a substance much like carbolic acid. The French Government has always been alert and liberal in this matter of practical entomology, a subject more important to agriculture than dreamed of in this country, where it is estimated that we lose hundreds of millions of dollars annually from the attacks of injurious insects, etc. Two states in the Union—Illinois and Missouri have salaried officers, who, with a good knowledge of entomology, do much by spreading facts about noxious and beneficial insects among the people. But the leading agriculturists of other states practically, with one or two exceptions, ignore the matter. During the past summer the losses of wheat, corn, and other crops in the Western States have been enormous. The farmers in one county in Massachusetts have lost at least fifteen thousand dollars' worth of onions, their most valuable crop, next to hay, from the attacks of a minute insect, called Thrips. This annual loss, much of which could be now prevented, will accumulate in intensity, and be most grievous a century hence, when our country will become more densely populated and every grain of food will be needed.

The foresight of the French people, despite the present gloomy views of the "Revue Scientifique" and "France Scientifique" over the decadence of science among them, is conspicuous in their prompt and scientific treatment of the silk worm disease. Pasteur and Quatrefages, and others whose names are illustrious as investigators, have been commissioned to study the causes of this disease; and it is now thought, following out the suggestion of Pasteur — the result of profound studies on this subject — that if healthy eggs be selected and those infested with the parasitic fungus be destroyed, silk culture will be again restored in France and Southern Europe. A single silk-raiser, whose worms this year

will produce thirty-two thousand ounces of eggs, hopes next year to have a hundred thousand ounces, and the prospect of a profit of a million dollars! It should be remembered that this remarkable result is due primarily to the most minute researches upon microscopic plants by specialists, for the pure love of science. Their cloister studies, put to practical account, save the destruction of one of the largest agricultural interests in Southern Europe. In like manner had the government or individual states of America encouraged the entomologist and botanist in their studies, and caused them to be turned to practical account, we should not have had to give up the cultivation of wheat in the northernmost states, and our cotton crop could have been perhaps doubled, to say nothing of fruits and vegetables. Increased attention is paid now in England to economical zoology and botany. A botanist has recently been appointed to the Royal Agricultural Society, and an entomologist will soon be elected.

On the Occurrence of Setophaga picta in Arizona.— Lieut. Charles Bendire, U. S. A., stationed near Tucson, has communicated to Professor Baird the capture of the above-named species near that post. It was shot April 4th, 1872, and was found "running around the larger limbs of cottonwoods in search of larvæ and insects." Its manners are stated to be "considerably like the Certhiadæ."— Robert Ridgway.

Zoological Nomenclature.— "In the President's Address to the Entomological Society of London recently given by Mr. Wallace, one of the points most fully discussed is the rules of zoological nomenclature. These rules are undoubtedly of very considerable, though indirect, importance to science and it is not very satisfactory to find that great divergence of opinion as to what these rules are, or should be, still prevails amongst recent describers and cataloguers.

Some years ago I was entrusted by the Entomological Society with the task of preparing a synonymical catalogue of the Coleoptera of our islands, to be published under the auspices of the Society; my attention, therefore, has necessarily been directed to the questions under discussion in this matter, and I will here state the conclusions to which I have come.

1st. That a committee to frame and publish laws on zoological nomenclature is not to be desired. Such committee would have

no power whatever to enforce the laws it might make, and could not be expected to put an end to discussion on these points. The knot must be untied, not cut.

2nd. That the binomial system of nomenclature should not be arbitrarily considered to have commenced at any given date; but that recognisable names in all works in which this system is methodically employed should be used according to the rule of priority.

3rd. That it is not necessary to suppress a generic name in zoology because it has been previously used in botany (or *vice versâ*); but that it is much to be regretted that any generic name should thus be in double use, and it should always be made a matter of reproach to an author that he has committed an act of this nature.

4th. That names must be Latin to the extent that renders them capable of being written or used in scientific Latin; but that classical emendations beyond this are entirely inadmissible; no line except this can be drawn between emendation, alteration, and total suppression. The laws of classical languages have *per se*, no more right over scientific nomenclature than has the Hindoo language. As regards the much talked-of 'Amphionycha knownothing,' it should be latinised in the simplest manner, as *Amphionycha knownothinga;* and I would further suggest that its barbarian author be well hissed whenever he ventures to show his face in a scientific assembly.

5th. That as regards placing an author's name after a species, the name so placed should always be that of the first describer of the species, not because he has any right in the matter, but as an additional means of certainty, and as a security against change.

6th. That the specific name is the name of an object, and therefore a noun, and should be changed in gender, or any other manner, when removed from one genus to another.

7th. That it is very undesirable to use the same specific name in two closely-allied genera; but that where this has been done already no alteration should be made till the names actually come into collision on account of the two genera being united as one genus. Surely to act otherwise is like cutting one's throat for fear somebody else should do it.

8th. That as regards placing an author's name after a genus, the name so placed should be that of the author who established the genus in the sense in which it is actually used. *Carabus* of

Linnæus included all the insects now comprised in the family *Carabidæ*, at present divided into several hundreds of genera. To write, therefore, *Carabus* Linn., when we mean something entirely different, may be usual but is not desirable.

I may add, that I consider it useless to expect a perfectly stable zoological nomenclature, until zoology itself is complete and perfect; but that in order to reduce changes to a minimum, classical and other secondary claims must not be allowed any great importance."— D. SHARP, *in Nature*.

GEOLOGY.

A NEW GENUS OF UNGULATES.— At a meeting of the American Philosophical Society, April 2nd, Prof. Cope stated that the largest mammal of the Eocene formations adjoining those of Wyoming, *i. e.*, of the Wahsatch group of Hayden, was the *Bathmodon radians* Cope, of about the size of Rhinocerus. It was an odd toed ungulate, with peculiar dental characters. The incisors were well developed above and below, as in the tapir, but the dental series was little interrupted. The crowns of the molars were all wider than long, and presented mixed characters. On the outer margin one only of the two usual crescents of Ruminants was present, but a tubercle represented the anterior one. The one which was present was very obliquely directed inwards. Inner crescents were represented by two angles, the posterior forming the inner angular margin of a flat table, the anterior a mere cingulum at its anterior base. The arrangement of these parts was stated to be of interest in connection with the relationships between the types of hoofed animals. The single outer crescent was a ruminant indication, while the inner table resembled the interior part of the crown of Titanotherium. It differed, however, in its early union with the outer margin, its edge being thus possibly homologous with the posterior transverse crest in *Rhinocerus*. The premolars had two or three lobes with crescentic section arranged transversely. He regarded the genus as allied to *Chalicotherium*. He stated that the mammalian fauna of Wyoming and Utah more nearly resembled that of the Paris Basin than any yet discovered in our country, and that it contained a still greater number of generalized mammalian forms. One of the most marked of these was the genus *Anchippodus* of Dr. Leidy.

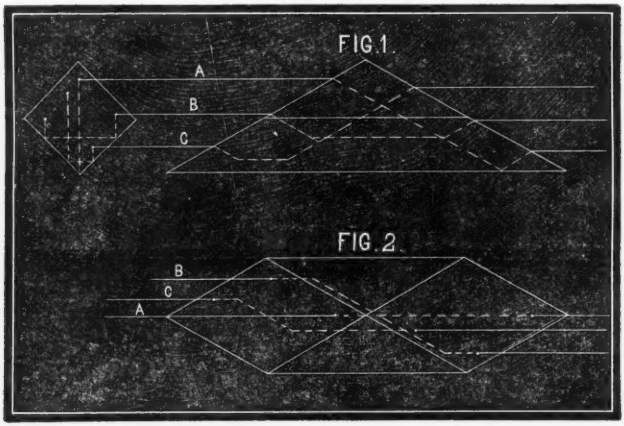
BOWLDERS IN COAL.—In the May number of the NATURALIST (page 291), is an extract from the "Report of the Ohio Geological Survey," in which Prof. Andrews describes the occurrence of a quartzite bowlder in the coal of Ohio. This bowlder, he thinks, must have been transported there by ice; and to account for the ice he supposes a much colder climate for the coal period than most geologists would be willing to admit. It seems to me that a much simpler explanation, which dispenses with the supposed cold climate, is quite sufficient to account for the facts. It is well known that, during freshets, trees on the banks of streams are often undermined, and floated away, bearing in their roots large stones, which may thus be carried to great distances. In this way the small bowlder found in the coal of Ohio might easily have been transported. Similar instances of bowlders in seams of coal have been observed in this country and in Europe.—O. C. MARSH.

FOOD OF PLESIOSAURUS.—At a meeting of the Academy of Natural Sciences, May 28th, Prof. Cope exhibited some vertebræ of a Plesiosauroid reptile and those of a smaller species, probably a *Clidastes* which were found in close proximity near Sheridan, Kansas, by Joseph Savage of Lawrence. According to this gentleman the vertebrate column of the *Clidastes* was found immediately below that of the Plesiosauroid and in a reversed position, as though it had been swallowed by the latter or larger reptile. The largest vertebræ of the *Clidastes* were about three-quarters the length and one-fourth the diameter of those of the Plesiosauroid, and the animal must have furnished a large or, at least, a long mouthful for its captor. The bones of the *Clidastes* were not in good condition, but resembled those of *C. cineriarum* Cope, though smaller. The Plesiosauroid was a species of over thirty feet in length and was the third species found in Kansas. It was new and was named *Plesiosaurus gulo*.

MICROSCOPY.

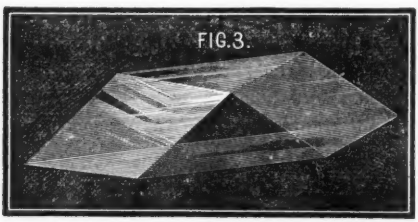
A NEW ERECTING PRISM.—Mr. Joseph Zentmayer exhibited, at a meeting of the Franklin Institute, a single prism which erects the image completely and in such a way that the incident and emerging rays are parallel, which, as far as we know, was never accomplished before. In connection with the microscope, as it was shown, it interfered very little with the definition, and, although

the light is twice refracted and reflected, the loss of light is much less than one would expect. With the microscope, the prism is placed right above the objective, and the instrument may be used



in any inclined position. A pair of such prisms might be used also for an erecting binocular microscope, of which the two bodies have the same inclination to the stage.

Fig. 1 shows the front and profile of the prism. The projection of the front is a square, that of the profile an isosceles triangle.



The angles at the base of the triangle are 27°19 for crown glass of a refracting index of 1.53, in order to obtain the greatest aperture combined with the smallest prism.

Fig. 2 is a view from above. The rays A, B and C of figs. 1 and 2 are the identical ones, their dotted parts are the projections of the rays inside of the glass, and their course may be readily followed in the profile, fig. 1, where the upper ray, A, emerges as the lower one, and the lower ray, C, as the upper one.

As the ray A enters in the perpendicular line above the lower

edge, it will not be reflected out of its plane, while the rays B and C, entering the left side of the prism, reach the inclined faces, from which they are reflected to the opposite lower one, and are changed in their course to the right, from here again reflected, to emerge at the corresponding opposite point. Fig. 3 is a perspective representation of the prism. — *Journal of the Franklin Institute.**

STEPHENSON'S BINOCULAR.— Mr. Stephenson has reported to the Royal Microscopical Society, some improvements in his erecting binocular microscope. The lower prisms by which the light is divided and the image laterally inverted, are made smaller than before and placed nearer to the back combination of the objective. They are now made .68 in. long, .412 in. wide, and .2 in. thick; and are inclined to each other at an angle of $4\frac{3}{4}°$, making the angular divergence of the bodies $9\frac{1}{2}°$, and the distance of the point towards which the eyes converge nearly fifteen inches. The prisms of this size are mounted in a small tube which projects beyond the nozzle of the instrument, and into the mounting of the objective nearly to the posterior combination of glasses. The quantity of glass in the prisms is greatly reduced, and powers as high as $\frac{1}{8}$ in. may be easily used. The standard length of body is secured: and also an easy convergence of the eyes.

By altering the angle of inclination of the bodies to the perpendicular from 75° to $66\frac{1}{2}°$ the use of a Nicol's prism as an analyzer, which is quite unsatisfactory in a binocular, is easily dispensed with. When polarized light is used the box containing the upper prisms (the original upper prism being now made in two parts) is withdrawn and an analyzing plate of highly-polished glass substituted, reflecting the light at the polarizing angle of $56\frac{3}{4}°$, and securing more light and improved definition.

If desired, the upper prisms may be likewise replaced by a plane mirror silvered by the beautiful process employed by Mr. Browning in the manufacture of his reflecting astronomical telescopes. Thus we get rid of all the glass and of two surfaces, but obtain an incomplete reflection and a less permanent reflector.

OPAQUE ILLUMINATION UNDER HIGH POWERS.— H. A. Johnson, M.D., President of the State Microscopical Society of Ill., communicated to that society another method of producing this difficult effect. He employs Prof. H. L. Smith's plan of making

* We are indebted to the *Journal* for the use of the above cuts.

the objective its own illuminator; but instead of the silvered reflector, thin glass disc, or reflecting prism, used by Prof. Smith and subsequent experimenters, he employs the binocular prism of Wenham's binocular. A beam of light reflected down the oblique body of the Wenham binocular, the prism being in position as for ordinary use, is of course condensed by half the objective upon the object in its focus; while the other half of the objective and direct body of the instrument is used at the same time as a monocular for viewing the object. A portion of the field is intensely illuminated, and definition is said to be better than with other arrangements.

Collins' Light Corrector.— Mr. Collins, of London, has introduced a modification of Rainey's Light Modifier, to correct the glare of too intense light or the yellowness of gas-light, lamp-light, etc. A thin plate contains a rotating wheel with four apertures one of which is empty while the others present in turn a ground glass and two shades of blue glass. This contrivance, an illustration of which may be seen in the advertisements in "Science Gossip," is always ready for use, being simply laid, under the object, upon the stage of any microscope; though for use with an achromatic condenser it is somewhat better to have the correcting plate, whether of ground or blue glass, below the condenser. The new form of Light Corrector may be obtained of Miller Bros. whose address is given elsewhere in this number of the Naturalist.

Measurement of Angular Aperture.— For those students whose stands have not a graduated rotating base, Prof. T. D. Biscoe recommends a plan especially applicable to the larger form of achromatic condensers which cannot be as conveniently arranged for the method advised by Dr. Carpenter. He places the combination horizontally, with a gas flame several feet distant behind it to furnish nearly parallel light, holds a card across the centre of the front lens so as to bisect the cone of light, and with a fine pencil marks the edges of the illuminated portion of the card. A common protractor is used to measure the angle of the lines thus drawn. Though chiefly useful to measure the eye-piece form of achromatic condensers (Webster's condenser, etc.) as actually used with diaphragm, etc., in position, the method may be sometimes convenient for objectives of low power. Prof. Biscoe believes it can be applied to objectives as high as $\frac{1}{4}$ in. of 110° and be reliable within one or two degrees.

ORGANISMS IN CHICAGO HYDRANT WATER.—The "Lens" publishes an interesting note on the subject by H. H. Babcock of Chicago. While the Chicago river flowed into Lake Michigan, pouring into it a slow current of almost stagnant water saturated with organic matter, the hydrant water used in the city, taken from the lake at a point two miles from the shore and where the water is forty feet deep, contained an abundance, though a greatly varying quantity, of organisms, such as diatoms, etc. When the current in the river was reversed, so as to flow from the lake, the vegetable and animal forms mostly disappeared from the hydrant water; and the improved sanitary condition of the city, generally attributed to the absence of the former noxious effluvia from the river, may be due in part at least to the increased purity of the drinking water from the lake. The writer at first suspected that the water of the river had previously directly contributed the organisms found in the water from the "crib," but afterward was led to conclude that the change in the direction of the river only acted by changing the direction of the currents from other sources in the lake, thereby leaving the crib in purer water than before. Much more investigation of this kind ought to be immediately accomplished in view of the growing tendency, if not the imminent necessity, of supplying to our cities water from lakes and large rivers.

RECORD OF NEW FUNGI.—E. C. Howe of New Baltimore, N. Y., has recently discovered and described several new species of Fungi as follows:—*Uncinula luculenta*, *U. Americana*, *Microsphœra sparsa*, *M. finitima*, *Pestalozzia Zabriskiei*, *P. insidens*, and *Phragmidium fallax*.

PODURA SCALES. — American microscopists experience great difficulty in obtaining a satisfactory supply of these objects. The English Journals are agitating the same subject, and there seems to be some mystery as to the source of the familiar "test" scales. Mr. McIntyre suggests, not confidently, that they may be developed upon the common *Lepidocyrtus curvicollis* late in life. Mr. Joseph Beck states that no amount of age will develop them upon the common form of this insect, though they belong to an insect entomologically identical with it but having a different habitat: while E. G., of Matlock, recollecting that the late R. Beck told him that he found the Podura in the rockwork in his mother's garden, hunted for them in a cellar and found a lead-colored species which yielded scales equal to Mr. Beck's. He admits, however,

that only one slide in twenty, perhaps one scale in five thousand, was of any use. In his slide prepared by Mr. R. Beck there are only two well marked scales, which appear to be the exception and not the rule. Dr. Josiah Curtis, of Knoxville, Tenn., has been successful in collecting species of Lepisma, "Podura," etc.

THE STUDY OF "DIFFICULT" DIATOMS.—Mr. J. Edwards Smith of Ashtabula, Ohio, writes the following note which is suggestive of the experience of many microscopists who study the finer diatoms without making a specialty of them.

"I find that Pritchard describes *Navicula cuspidata* as having close *transverse* striæ. I have slides of this diatom, mounted dry and in balsam, and with my Tolles' $\frac{1}{8}$ dry, or $\frac{1}{16}$ wet, have no difficulty in showing longitudinal striæ, far finer than the transverse; indeed when mounted dry both sets can be plainly seen at once. Is there anything remarkable about this?

I notice that Möller places *Navicula crassenervis* as the 18th on his 'Probe Platte'. I fail to discover striæ on this diatom either in balsam or mounted dry. Pritchard says they are sometimes wanting. The objectives above named show the fine lines in No. 17 (*Cymatopleur elliptica*) very nicely, but fail on Nos. 18, 19 and 20. Our friends here are interested to know what others are doing with this 'Probe Platte.' Has Amphipleura pellucida been resolved in balsam? When, by whom, and with what lenses?"

ANS.—Nothing can be more certain than the uncertainty of what has been known, in regard to the markings and structure of diatoms. It would be rash at present to pronounce any shell free from markings, and would probably be repeating a mistake too often made already. Different shells of the same species vary greatly in "difficulty," but no explanation or excuse is necessary for a dry $\frac{1}{8}$ failing to go entirely through the series on the test-plate. It is by no means easy, though sometimes possible, to resolve *A. pellucida* in balsam with dry lenses and ordinary illumination. With immersion lenses, however, and monochromatic illumination, there is no difficulty in accomplishing this with objectives of Tolles, Wales, Powell and Lealand, Beck, Hartnack, and Nachet, and doubtless several other makers. About two years ago Count F. Castracane resolved and photographed *A. pellucida* in balsam, with French lenses and monochromatic sunlight. For a method by which this can be easily accomplished see Dr. Woodward's paper in the NATURALIST for April last.

NOTES.

Again has science been called upon to give up one of her brightest lights and most enthusiastic devotees, and many of our readers have in the death of Dr. William Stimpson to mourn for a dear friend. Dr. Stimpson was born in Cambridge, Mass., and early became devoted to Natural History pursuits. He also had the good fortune of being under the guidance of Agassiz and soon became an original investigator and distinguished as a malacologist. His first publication was on the marine shells of New England, in 1851. From this time he pursued the study of Marine Zoology with the greatest vigor, and dredged and collected along our Atlantic Coast from Florida to Grand Menan, until he became the authority in the lower forms of animal life, especially in the classes of Crustacea, and Mollusca, and until Mr. Verrill commenced his work on our Radiates, Dr. Stimpson was the acknowledged authority in that group also. In the classes of Mollusca and Crustacea of our Atlantic coast, Dr. Stimpson was to the time of his death the acknowledged head of the able band of workers in these departments, while his connection with the Government Exploring Expedition to the North Pacific, as naturalist, gave him a wide field of work in his most favorite study of the Crustacea, in which he shared equally with Dana the honors of the scientific world. As a dredger Dr. Stimpson early became noted, and taking his first lessons in our own harbor of Salem, under the guidance of Dr. Wheatland, he soon became the pioneer in this science along our whole coast, and his very last work was the superintendence of the deep sea dredging off the coast of Florida under the direction of the Coast Survey. Dr. Stimpson's connection with the Chicago Academy of Science, as the successor of the lamented Kennicott, is known to all, and to the disastrous fire, which in one short hour destroyed all his material, manuscripts, drawings, specimens and library, must we attribute the close of his life at the age of forty-two years. For though suffering from lung disease, there is little doubt but that for the fearful calamity which so suddenly destroyed all his work and hopes, he would have lived to have seen published the valuable works, which, owing to a fatal delay on the part of government, are now irrevocably gone;

though the many descriptions and preliminary papers which he published, and his early works, will forever connect his name with the marine zoology of the world.

The Committee to arrange for the next meeting of the Association for the Advancement of Science have informed us, just as we go to press, that the meeting *will not* be held in San Francisco as previously announced, but in **Dubuque, beginning on Wednesday morning, August 21st, at 10 o'clock.** We shall give all the details possible in our August number, and the circulars to members will undoubtedly now be issued at once by the Local Committee.

It will be noticed that the Herbarium of the late Rev. M. A. Curtiss of Hillsboro, N. C., the veteran and highly esteemed Mycologist, is offered for sale in our advertising pages. But a few months ago we were in correspondence with Dr. Curtiss, relative to the publication of his manuscripts and drawings on the edible fungi of the United States, and though aware of his feeble health we had no reason to suppose his life labors were so nearly over; the first intimation we received being the request to publish the advertisement given in this number. Dr. Curtiss has so long been identified with the study of the important and interesting group of Fungi, and has so extensively exchanged and collected specimens, that his collection must be of the highest value as an authentic one in this most difficult department, and we trust that it will at once be secured for some prominent herbarium where his life-long labors will be appreciated and made useful.

"It is with very great regret that we have to record the death of Mr. George Robert Gray, which took place on the 6th of May, after a short illness. He was born in the year 1808, at Little Chelsea, and was appointed an Assistant in the Zoological Department of the British Museum in 1831. At the time of his death, he occupied the post of Assistant Keeper of that department. He established his reputation as an ornithologist by his "Genera of Birds," a great work, in the production of which he was engaged for twelve years, from 1837 to 1849. From that time he was *facile princeps* in this branch of science, to which he devoted himself almost exclusively. Only a short time before his death he completed his invaluable "Handlist of Birds," published in three volumes by the Trustees of the British Museum."— *Academy.*

THE Boston Society of Natural History have very wisely decided to offer the *Annual Walker Prize for* 1873 for a memoir "On the development and transformations of the Common House Fly," thus not only carrying out the liberal bequest of Dr. Walker, in offering pecuniary assistance to worthy investigators, but at the same time calling attention to how little is known of the early life-history of one of the most abundant of insect pests. Trusting that the prize may induce several of our entomologists to turn their attention, for this year at least, to the much neglected group of Diptera we refer to the advertisement for particulars.

ANSWERS TO CORRESPONDENTS.

E. M.—The Diatom of your figure and description may possibly be *Triceratium spinosum* B., which has been obtained from Florida, and which varies so greatly that it has been described under several different names. We should like to have specimens for further examination.—R. H. W.

T. W.—The "Society Screw," to which are fitted all American and a large proportion of European objectives, is practically indispensable to a satisfactory microscope at the present day; yet it should not be considered by any means indispensable in buying a microscope. It can be added, by means of an adapter costing about one dollar, to any microscope large enough to work the modern objectives.—R. H. W.

H. H. Y.—Wants to know what causes the bursting and curling of the pod of Touch-me-not (*Impatiens*)? Strongly unequal tension: the outer and juicy part of the wall wants to expand, the inner to contract: a slight displacement, destroying the equilibrium of the pressure of the valves on each other, gives rise to the result. He also wants to know "what force governs the sensitive plant"? The movement is a vital one—as much so as the movement of our hand in writing. But the force that moves the leaf-stalks is, again, one of *tension*,—unequal tension upon different sides. How the unequal tension is brought about, if to be explained at all, cannot be explained in a word or two.

E. H., Jr. Amherst, Mass.—The capture of two specimens of the Cape May Warbler (*Dendræca tigrina*) in May of this year at Amherst, Mass., by Messrs. S. Dickinson and W. A. Stearns, Jr., is an interesting fact. It is properly regarded as a rare bird in this State, occurring sparingly and at irregular intervals. (See Amer. Nat., Vol. III. p. 578.)—J. A. A.

L. H. N.—(Finds Dr. Woodward's method of resolving *Amphipleura pellucida* to work splendidly.) Should you succeed in resolving the above diatom, in balsam, with any lenses of less than 1-8 in. equivalent focus, rated on the principle of 1 in. by 10, we should be glad to know the particulars, including the amplifying power and angular aperture *of the objective* both at open point and at the working point as used for the resolution. We should also be glad to know the amplifying power and working angle of your Powell and Lealand 1-16 as adjusted for the work so well done by it.—R. H. W.

L. F. A., Wilton, Maine.—Some grasshoppers hibernate in the perfect, some in the larva or pupa, and others in the egg state. The borer which you find far up in the trunk of your apple trees, is doubtless *Chrysobothris femorata* Fabr., popularly known as the Flat-headed Borer.—C. V. R.

C. N. S., Fayetteville, Pa.—The small borers which infested your young peach shoots while they were in blossom, judging from your description, and from a dried and flattened specimen received through Mr. S. S. Rathvon of Lancaster, were the larvæ of a small slate-colored moth—*Anartia lineatella* Zeller. We have bred it from peach-stem-boring larvæ, and it has similar habits in Europe, being common to both countries. The larva of *Gortyna nitela* Guen., a much larger moth, also bores into peach stems.—C. V. R.

J. L. L. Jr., Boston, Mass.—Your figure represents the Book-Scorpion or False-Scorpion (*Chelifer cancroides* Linn.). It runs sidewise and backwards as well as forwards; feeds on mites and book-lice (*Psoci*) and is consequently not injurious.—C. V. R.

C. W., WETHERSFIELD, CONN.—The two worms which you send are both larvæ of the Imported Currant-worm (*Nematus ventricosus* Klug). The spotted specimen not having yet undergone its last molt, while the immaculate specimen has. One of the peculiarities of this larvæ being that it loses, after the last molt, the black spots which characterize it in the earlier stages. If Mr. Packard in his first Report has not given the systematic name, it is probably an oversight. The ♂ was named *affinis* and the ♀ *trimaculatus* by St. Fargeau, who, of course, knew nothing of the insect's habits; and Dr. Fitch, by a singular oversight, subsequently adopted St. Fargeau's ♀ name.—C. V. R.

BOOKS RECEIVED.

Second Annual Report on the Noxious Insects of the State of Illinois. By William LeBaron. 8vo pamph. 1872. Springfield.

Annual Report of the Trustees of the Museum of Comparative Zoology at Harvard College, in Cambridge, together with the Report of the Director for 1871. 8vo pamph. Boston, 1872.

Fourth Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri. By Charles V. Riley. Illustrated. 8vo pamph. 1872. Jefferson City.

Bulletin of the Museum of Comparative Zoology. Vol. III. No. 4. Preliminary notice of a few species of Echini. By Alexander Agassiz. 8vo pamph. 1872.

Annual Report of the Board of Regents of the Smithsonian Institution for 1870. 8vo. pp. 494. Washington, 1871. [April, 1872.]

Spectrum Analysis Explained and Spectrum Analysis Discoveries. Forming Nos. 3 and 4 of Half-hour recreations in Popular Science. Edited by Dana Estes. 12mo. Boston. Lee and Shepard. 1872.

Societe Malacologique de Belgique. (Bulletins des Seances.) 8vo. pp. 25-40. 1872.

Second Annual Report on the Injurious and Beneficial Insects of Massachusetts made to the State Board of Agriculture. By A. S. Packard, Jr. 8vo. pamph. 1872. Boston.

Affinities of Paleozoic Tabulate Corals with existing Species. By A. E. Verrill. (From the Am. Jour. of Sci. and Arts. Vol. 3. March, 1872.)

Spiritualism answered by Science. By Edward W. Cox. New York. Henry L. Hinton. 1872.

Recent Additions to the Molluscan Fauna of New England. By A. E. Verrill. (From the Am. Jour. of Sci. and Art. Vol. III. March and April, 1872.) 8vo pamph. New Haven.

Progressive Bee Culture. Illustrated and Systematized. By Dr. L. Adair. 8vo pamph. 1872. Cincinnati.

Catalogue of the Birds of Kansas. Contributed to the Kansas Academy of Science. By Frank H. Snow. 8vo pamph. Topeka, Kansas. 1872.

Tidsskrift for Populære Fremstillinger af Naturvidenskaben. 8vo pamph. Fjerde Række: Fjerde Binds, Forste Hefte. Fjerde Binds andet Hefte. 1872. Kjobenhavn.

Observatorio Astronomico Argentino. Discursos sobre su Inauguracion revificada el 24 de Octubre de 1871. 8vo pamph. 1872. Buenos Aires.

Horæ Societatis Entomologicæ Rossicæ. 8vo. Tome vii. No. 4. Tome viii. No. 2. 1871. Petropoli.

La Production Animale et Vegetale. 8vo. 1867. Paris.

Bulletin Mensuel de la Societe d'Acclimation. 8vo. Tome viii. Nos. 1-12. 1871. Paris.

Bulletin de la Societe Imperiale des Naturalistes de Moscou. 8vo. Tome xliv. Nos. 1 et 2. 1871. Moscou.

Jahrbuch der kaiserlichen-koniglichen Geologischen Reichsanstalt. 8vo. Band xxi. Nos. 3 and 4. 1871. Wien.

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